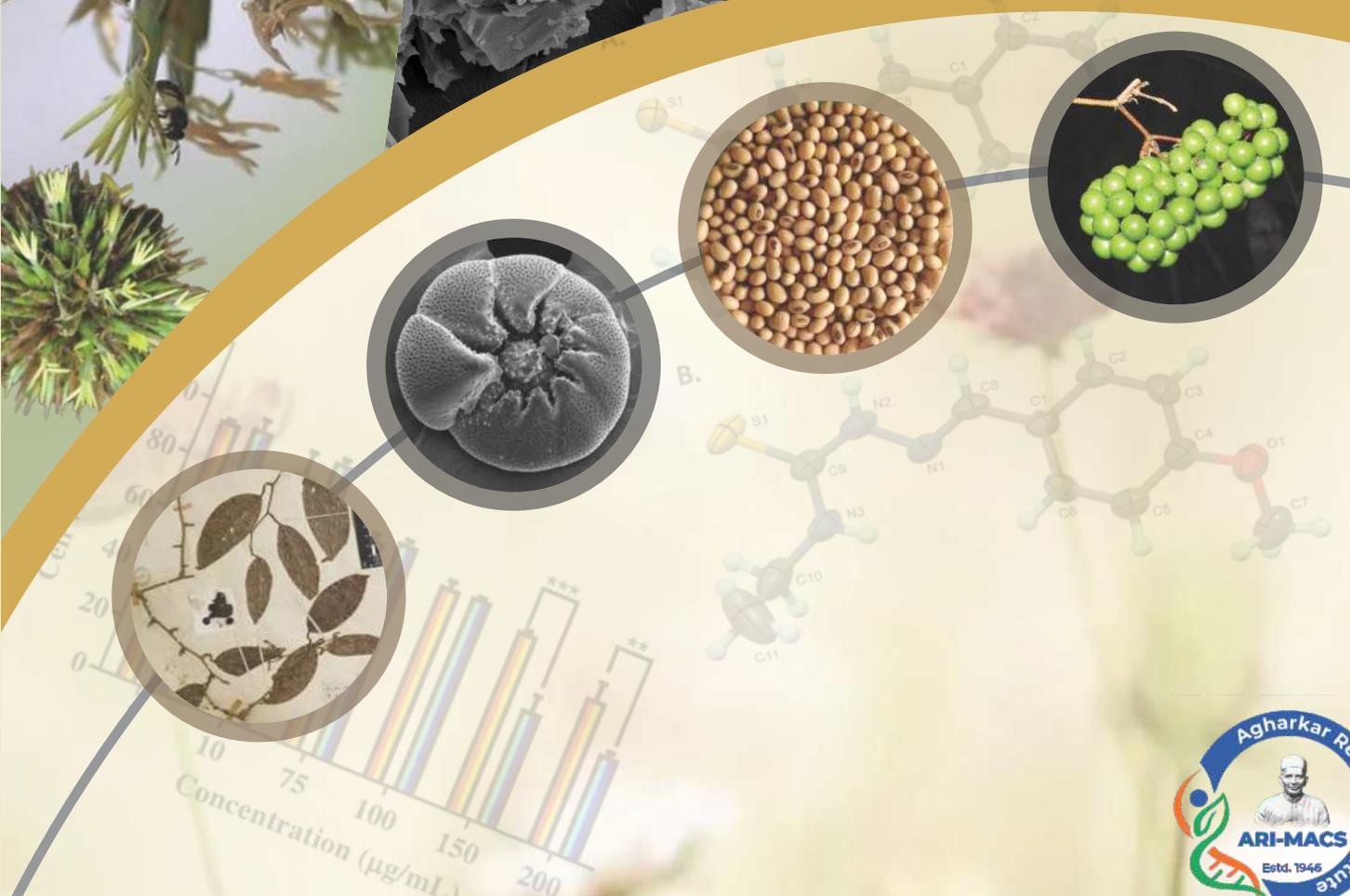


# Annual Report 2021-22



## Vision

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

## Mission

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- 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

## Objectives

---

- a. Undertake research in cutting-edge science and its applications
- b. Develop and translate technologies for cleaner environment and better health
- c. Develop and adopt practices for sustainable agriculture



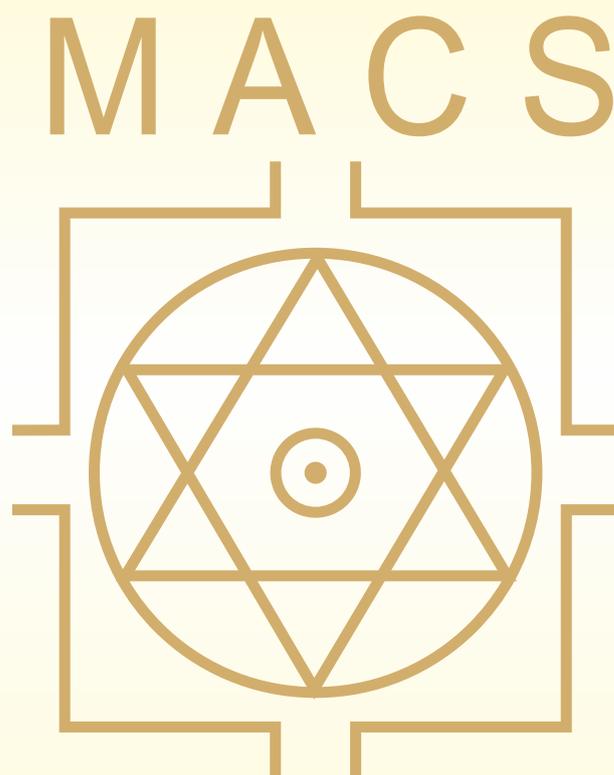
# Annual Report 2021-22



Maharashtra Association for the Cultivation of Science  
Agharkar Research Institute

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Pune, India



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discipline

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Dr Mohan R Wani, Scientist G, NCCS Pune, DBT  
Nominee

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Dr Vijaya A Pandit, Head, Dept of Pharmacology,  
Bharati Vidyapeeth Deemed Univ, Medical College,  
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Dr Anuradha Ratnaparkhi, ARI, Member-Secretary

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Dr Abhishek Baghela, ARI, Internal Member

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Dr. P. P. Kulkarni

## **Central Public Information Officer, ARI**

Mr P. V. Gosavi,

## **Grievance Officer, ARI**

Dr. G K Wagh



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# Foreword



## **Dr. Anil Kakodkar**

President

Maharashtra Association for the Cultivation of Science  
Pune

Azadi Ka Amrit Mahotsav,' an initiative of the Government of India to commemorate 75 glorious years of free and progressive India, its rich heritage, diverse society, magnificent culture, and outstanding achievements. Our organization, Maharashtra Association for the Cultivation of Science, established in October 1946, has also completed 75 years of its glorious existence a year before. I feel it pertinent to summarize the achievements of MACS-Agharkar Research Institute, more so during 'Azadi ka Amrit Mahotsav.'

The founders of the MACS had realized the importance of scientific research in nation-building. Since then, MACS has been pursuing essential research areas such as developing high-yielding and disease-resistant crop varieties, biodiversity studies focusing on microorganisms and plants, and environment-friendly sustainable development.

MACS-Agharkar Research Institute has significantly contributed to our nation's food security by developing high-yielding, disease-resistant wheat, soybean, and grapes varieties. This program coincides with our nation's rise as an exporter of food grains from the earlier ship to mouth state. ARI scientists have documented the diversity of plants and microbes from the biodiversity hotspots. Documenting our nation's rich biodiversity has enriched the repositories at the Institute. These include the collections of microorganisms, fungi, lichens, diatoms, and angiosperms. Such efforts are important to know and understand our resources, potential economic activities as well as conservation efforts and prevent biopiracy. Our fossil collections offer impressive study material to paleontologists. ARI scientists have also made significant contributions in the area of bioprospecting. Isolation of natural bioactive compounds, synthesis of their more active but less toxic derivatives for the treatment of non-communicable diseases such as Alzheimer's disease, anemia, diabetes, and cancer has remained one of the major areas of research at the Institute.

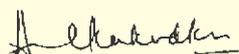
The biological treatment of waste has been a hallmark of our research. ARI scientists have developed environment-friendly technologies for treating wastewater from domestic and industrial sources. The energy generation from biomass has led to the development of promising technologies. Most of the know-how has attracted commercialization. ARI scientists have also developed multiple nanotechnology applications for (i) disease diagnostics, (ii) nanomedicine, and (iii) nanoformulations in the domain of pest control in agriculture.

The Institute has been involved in using model organisms like zebrafish, drosophila, and hydra to study cellular signaling and morphogenesis by combining genetics with molecular biology and imaging.

It is thus clear that MACS' Agharkar Research Institute, has lived up to the scientific and patriotic zeal of the visionary founder members of the Maharashtra Association for the Cultivation of Science. There is however no room for complacency and we need to continuously scale greater heights in scientific excellence and contributions to national development.

Before I conclude, I would like to place on record my appreciation of MACS-ARI scientists and staff for contributing to new knowledge in areas of their research and to new solutions to various needs of the society. Similarly, I would like to thank all the life members of MACS for their support and guidance to the MACS-ARI .

I once again sincerely acknowledge the continuing support of the Department of Science & Technology, Government of India.



**Anil Kakodkar**

21 August 2022

# Executive Summary



## Dr PK Dhakephalkar

Director  
Agharkar Research Institute  
Pune

Welcome to the MACS-Agharkar Research Institute (ARI), an autonomous institute of DST, Government of India. I take this opportunity with immense pleasure to present the Annual Report for the year 2021-22. This report illustrates our institute's scientific and other achievements during the past year. I can proudly enlist a few of the achievements of our institute as (i) impact papers in journals of high international reputation, (ii) filing of patent applications, (iii) transfer of technologies to the industry, (iv) release of improved crop varieties, (v) professional human resource development, (vi) state-of-the-art infrastructure establishment, (vii) dissemination of knowledge in the society, and (viii) contribution to the fight against Covid-19 pandemic. We could not have achieved so much without the constant and generous patronage of the Department of Science and Technology, Government of India. We gratefully acknowledge the same.

We are committed to developing bio-processes, bio-technologies, and bio-products that cater to the needs of society. ARI scientists developed sustainable microbial processes for the extraction of energy in the form of Hydrogen or Methane from the agricultural waste. These bio-processes for the clean energy have now been transferred to industry. Team-ARI conducted fifteen frontline demonstrations on farmers' fields to evaluate the impact of production technology improved by our scientists for the soybean cultivation. Farmers appreciated more than 15% incremental yield of Soybean as a result of adoption of these practices. ARI researchers published their impact papers in journals of high international reputation. Our scientists won accolades, fellowships and recognitions in their respective fields, which have motivated our researchers to direct our research towards societal benefit and improving the quality of life of ordinary citizens.

We believe in inculcating entrepreneurial skills among our students. One of our students, Snehal Jamalpure, won prestigious National Bio Entrepreneurship

Competition. She devised 'Matsya Suraksha', a technique for identifying viral diseases affecting the aquaculture industry. Another student; Ajay Lagashetti won DST AWSAR Award 2021 for popular story writing competition in Hindi Last year. Shiwali Rana and Tushar Kaushik won Best Poster presentation awards in international conferences. Nine research students were awarded PhD under the guidance of ARI scientists during 2021-22.

ARI harbors several culture collections and repositories. Their services were availed by hundreds of researchers from academia as well as industry. ARI has developed a Sophisticated and Analytical Instrumentation Facility (SAIF). These services were used by many at a reasonable cost. ARI also signed MoU with industry and academia for the collaborative research and training activities. ARI scientists released three books which were compendia of information useful for students and researchers. All books were available as e-books for free download on ARI website.

In short, ARI has conducted research in life and related sciences for human betterment; explored diverse microbes and plants to develop sustainable technologies for a cleaner environment and agriculture, which is in consistence with the mission of our institute. Continued pursuance of mission of our institute was possible only because of the patronage of DST, Government of India and generous support of funding agencies including the Indian Council of Agricultural Research, SERB, DBT, and industry partners, ONGC, KPIT Technologies Ltd., HTBSIL, etc. They have all readily rallied to enhance our cause. I must also make a special mention of the guidance we have received time and again from the Governing Body and Institute Council of ARI, which has helped our cause immensely. I must also gratefully acknowledge the efforts of scientists, staff and students of our institute. They all have been efficient, diligent, and cooperative. With their help and support, we look forward to continuing to serve the nation, collaborating with industry and academia, and working for society's benefit.



**PK Dhakephalkar**

16 September 2022

# ARI Scientists

## Biodiversity and Palaeobiology Group



Dr Sanjay  
K Singh



Dr Bhaskar  
C Behera



Dr Kantimati  
G Kulkarni



Dr Paras  
Nath Singh



Dr Ritesh  
K Choudhary



Dr Karthick  
Balasubramanian



Dr Rajesh  
Kumar KC



Dr Abhishek  
Baghela



Dr Mandar  
N Datar



Dr Tushar  
Kaushik

## Bioenergy Group



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Dhakephalkar



Dr Monali  
C Rahalkar



Dr Sumit  
S Dagar



Mr Pranav  
R Kshirsagar

## Bioprospecting Group

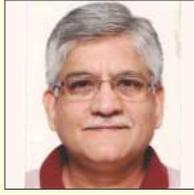


Dr Prasad P Kulkarni



Dr Pratibha Srivastava

## Developmental Biology Group



Dr Surendra M  
Ghaskadbi



Dr Anuradha  
Ratnaparkhi



Dr Sachin H Jadhav



Dr Chinmoy Patra



Dr Bhupendra V  
Shrivage

## Genetics and Plant Breeding Group



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D Oak



Dr Sujata  
P Tetali



Dr Ravindra  
M Patil



Mr Santosh  
A Jaybhay



Mr Ajit M Chavan



Dr Yashvanthakumar KJ



Dr VS Baviskar



Dr Sudhir Navathe

## Nanobioscience Group



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M Rajwade



Dr Dhananjay  
S Bodas



Dr Vandana  
Ghormade



Dr Virendra  
A Gajbhiye



Dr Yogesh  
A Karpe

# Biodiversity and Palaeobiology

## Biodiversity

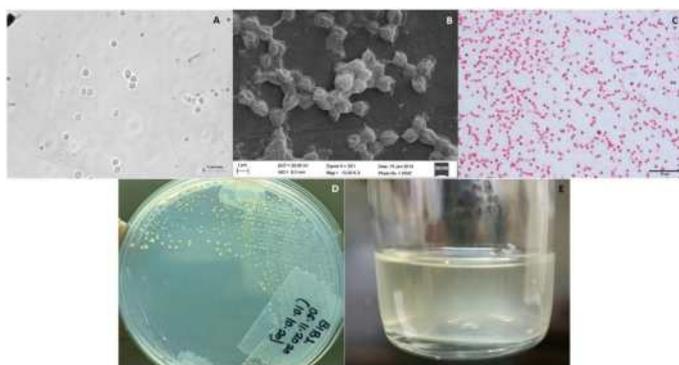
### Bacteria and Archaea

#### Development of a process for enrichment and isolation of methanotrophs from rice fields

Methanotrophs are aerobic to microaerophilic bacteria, which oxidize and utilize methane, the second most important greenhouse gas. The community structure of the methanotrophs in rice fields worldwide has been studied mainly using culture independent methods. Very few studies have focused on culturing methanotrophs from rice fields. We have developed and published a unique method for the cultivation of methanotrophs from rice field samples. The cultivation approach resulted in the isolation of methanotrophs from seven genera from the three major groups: Type Ia (*Methylomonas*, *Methylomicrobium*, and *Methylococcus*), Type Ib (*Methylocaldum* and *Methylomagnum*), and Type II (*Methylocystis* and *Methylosinus*). Our study was supported by 16S rRNA gene-based next-generation sequencing (NGS) of three of the rice samples. Our analyses and comparison with the globally detected taxa suggested that the cultured members represented the major detected taxa. We also cultured a putative novel species of *Methylomicrobium* strain RS1. *Methylomicrobium* has been detected globally in rice fields as a dominant genus, although no cultured representatives of *Methylomicrobium* have been isolated from rice fields worldwide. In this study, a total of 29 strains were obtained, which could be used as models for studying methane mitigation from rice fields and for environmental and biotechnological applications.

#### Isolation and cultivation of a novel *Methylobacter* species from black buck rumen

Enteric fermentation of methane by ruminant animals represents a major source of anthropogenic methane. Significantly less information is available on the existence of methanotrophs in the gut of ruminants. Therefore, detailed strain descriptions of methanotrophs isolated from ruminant faeces or gut are rare. We present a first report on the enrichment and isolation of a methanotroph, strain BIB1, from the faeces of an Indian antelope (blackbuck). The 16S rRNA gene sequence of strain BIB1 showed the highest identity (98.40% identity) to type species *Methylobacter marinus* A45<sup>T</sup> and *Methylobacter luteus* NCIMB 11914<sup>T</sup>. Strain BIB1 showed coccoidal cells (1.5–2 μm in diameter), which formed chains or aggregates of 3–4 cells of light yellow-coloured colonies on agarose when incubated with methane in the gas phase and pale-yellow turbidity (Figure 1). The draft genome of BIB1 (JADMKV01) is 4.87 Mbp in size, with a G + C content of 51.3%. The draft genome showed 27.4% digital DNA-DNA hybridization (DDH) and 83.07% average nucleotide identity (ANIb) values with that of its closest phylogenetic neighbour, *Methylobacter marinus* A45<sup>T</sup> indicating that this could be a novel species and hence we propose a *Candidatus* species name, '*Ca. Methylobacter coli*' BIB1. '*Ca. Methylobacter coli*' BIB1 would be the first described methanotroph from ruminants worldwide, with a sequenced draft genome. This strain could be used as a model for studies concerning methane mitigation from ruminants.

**Figure 1**

Morphology of strain BIB1: (A) live cells were observed under a phase-contrast microscope (Nikon 80i, Japan microscope with a camera) under 100X magnification with oil emulsion; (B) fixed and processed culture was observed under Scanning Electron Microscopy (SEM) (Zeiss model EVO-MA-15 SEM); (C) Gram-staining under light microscopy; (D) colony morphology on solid NMS medium plate; (E) BIB1 forms a turbid suspension with a yellow tinge in liquid dilute NMS medium

### Polyphasic characterization of a putative novel anaerobic *Actinomyces* species obtained from cattle rumen

An obligately anaerobic, rod-shaped, Gram-stain-positive, non-spore-forming, non-motile bacterial strain CtC72<sup>T</sup> (Figure 2) was characterized to ascertain its novelty. The phylogenetic and phylogenomic analyses revealed the strain as a member of the genus *Actinomyces*, nearest to but distinct from *Actinomyces qiguomingii* DSM 106201<sup>T</sup>, *Actinomyces ruminicola* DSM 27982<sup>T</sup>, *Actinomyces procaprae* JCM 33484<sup>T</sup>, *Actinomyces succiniciruminis* TISTR 2317, *Actinomyces glycerinitolerans* TISTR 2318. The physiological characterization showed the ability of strain CtC72<sup>T</sup> to grow at temperatures between 30-50°C, pH between 6.0-9.0 in the presence of NaCl between 0-1.5%. The strain hydrolyzed cellulose and xylan and utilized a range of mono-, di-, and oligo-saccharides, majorly producing acetic acid and formic acid and minor quantities of propionic acid lactic acid, ethanol and CO<sub>2</sub>. The biochemical and chemotaxonomic characteristics further highlighted the uniqueness in substrate utilization profiles and cellular fatty acid content of strain CtC72<sup>T</sup>, thus representing a novel *Actinomyces* species.

**Figure 2**

Microscopic image of *Actinomyces* sp. strain CtC72<sup>T</sup>

### Analysis and characterization of probiotic properties of microbial cultures

Probiotics are defined as live microorganisms which when administered in adequate amounts confer a benefit to the host. Twenty-one putative probiotic strains were screened. The cultures were first identified by 16S rRNA gene sequencing. They belonged to the *Lactobacillus*, *Bifidobacterium*, *Lactococcus*, *Streptococcus* and *Bacillus* genera. They were further characterized *in vitro* for their tolerance to gastrointestinal conditions and digestive enzymes, aggregation properties with pathogens, adhesion ability to different extracellular matrix components such as mucin fibrinogen and collagen, adhesion ability to HT-29 and Caco-2 cell lines, antimicrobial activity against pathogens, antimicrobial compound production and antibiotic susceptibility testing. The exopolysaccharide production by LAB strains, which is an important factor in the biofilm formation by bacteria, was also considered under the studies. The other properties which can contribute to the health benefits included the production of different enzymes such as bile salt hydrolase, proteases, lipase, etc. Whole genome sequencing using nanopore sequencing was performed to elucidate probiotic traits of the

bacterial cultures through its genome analysis. Genome mining revealed the presence of an arsenal of marker genes attributed to genuine probiotic traits.

The disease preventing effects of the putative probiotic strains were studied by testing for their antimicrobial activity against various indicator organisms such as *E. coli*, *S. aureus*, *S. typhi*, *K. pneumoniae*, *B. subtilis*, *E. aerogenes*, *P. aeruginosa*, *E. fecalis* and *S. dysenteriae* (Figure 3). Most of the strains which inhibited the pathogens were selected and further studied for the inhibitory activity in the culture supernatant against the same indicator organisms. The antimicrobial compound produced by a majority of strains was concluded to be lactic acid. The organic acids produced by the bacterial strains were analyzed using the HPLC system which supported the previous findings.



**Figure 3**  
Antibiotic susceptibility testing of putative probiotic culture

## Fungi

### Biodiversity, Systematics, Documentation and Conservation of Fungi

Screening of naturally occurring fungi is a continuous effort to understand the diversity and biosynthetic capabilities, and to obtain novel bioactive molecules beneficial to mankind. Three new genera *Paradictyocheirospora*, *Cylindrotorula* and *Neosporidesmina* were described based on morphology and phylogenetic analysis of sequences of combined ITS, LSU, RPB2 and TEF1- $\alpha$ . Seven new species, *H. maharashtraense*, *Penicillium uttarakhandense*, *Castanediella ambae*, *Kirschsteiniothelia shimlaensis*, *Paraconiothyrium ajrekarii* (Figure 4 a, b), *Cyathus uniperidiolus* and *Phaeoisaria synnematicus* (Figure 5 a, b.) were described and published. In addition to this, *Bipolaris heliconiae*, and *Favolus septatus* were encountered as new records. In this study, multigene phylogeny was conducted to resolve evolutionary relationships of more than 50 Indian *Fusarium* isolates based on the internal transcribed spacer region, 28S large subunit, translation elongation factor 1- $\alpha$ , RNA polymerase second largest subunit, Beta-tubulin and Calmodulin gene regions in order to resolve the taxonomy of the genus *Fusarium* which has been in a flux because of ambiguous circumscription of species-level identification based on morphotaxonomic criteria. These identified *Fusarium* species are preserved and maintained in NFCCI using short term and long-term preservation techniques like paraffin oil, glycerol and cryopreservation.

*Colletotrichum* is an important plant pathogen. The role of inter-specific conidial anastomosis tube (CAT) fusion in generation of genetic and phenotypic diversity in *C. gloeosporioides* was studied. Quorum sensing mediated inter-specific conidial tube fusion between *Colletotrichum gloeosporioides* and *C. siamense* was studied. It might help in understanding the basic CAT biology in emerging fungal model species of the genus *Colletotrichum*. Genera like *Aspergillus*, *Penicillium*, *Fusarium*, *Trichothecium* and *Acrostelagmus* and *Humicola* were studied in detail and found to possess promising alkaline protease activities which can be used in a wide range of applications in different industries.

Studies on yeast diversity and their potential were carried out. Yeast-like-fungi *Rhodotorula sampaioana* (order Sporidiobolales) and *Aureobasidium microtermitis* were reported as novel species based on

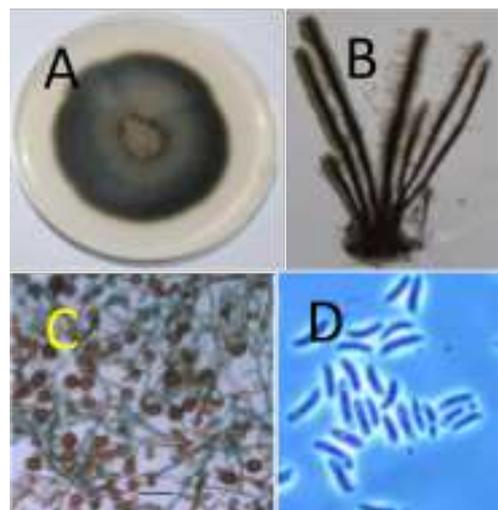
phylogenetic analyses of LSU and ITS sequences. Diverse thermotolerant yeasts were isolated from lignocellulosic biomass from buffalo rumen harbors and screened for their capability of producing second-generation bioethanol.

Out of 48 nectar yeasts, one was found to have a potential for xylitol-producing and role in the community of tropical flowering plants and their assessment for osmotolerance. We drew attention towards the tropical floral yeasts. Some yeasts were also studied for ethanol production at high - temperature. In a further study, thermotolerant yeasts isolated from compost (as an untapped niche) were studied in detail. Some of them were found capable of producing ethanol at high temperatures.



**Figure 4**

*Paraconiothyrium ajrekarii* (NFCCI-4810; AMH-10218 holotype) a. Colony on MEA, b Conidiomata developed in culture c. Conidiogenous cells bearing developing conidia. d. Conidia. Scale bars: b = 100  $\mu$ m c-d = 10  $\mu$ m



**Figure 5**

*Phaeoisaria synnematicus* (AMH10055, holotype; NFCCI 4479). A. Colony morphology (front view). B. Synnemata (*in-vitro* culture). C. Numerous chlamydospores in slide culture. D. Numerous conidia

## Lichens

Islands are often considered as “Biodiversity Hotspots”. Andaman and Nicobar Islands of India have shown a high number of endemic species. An attempt to document all the valid lichen taxa reported from these islands and characterization of these species based on the modern concepts of taxonomy along with the keys for determination of taxa along with the distribution has been undertaken.

Lichen family *Graphidaceae* including *Thelotremataceae* is the second largest family of lichenized fungi, next to *Parmeliaceae*; and one of the most important elements of lichen communities in tropical regions, with ca. 2100 species. To understand the diversity of this family, work on compilation of the species known so far from Asia has been taken up.

Field visit was conducted to explore the macro- and micro-lichen species diversity in various localities of the Western Himalayan region, and specifically from Uttarakhand. More than 250 lichen specimens (belonging to members crustose, foliose and fruticose) were collected and processed for preservation in the Ajrekar Mycological Herbarium at ARI.

## Plants & Diatoms

### Revisiting the taxonomy of the wild relatives of *Sarsaparilla* (*Smilax* L.) in India, developing super-barcodes, and understanding their diversification using phylogenomic tools

The genus *Smilax* L., also called Sarsaparilla or the greenbriers, is the type genus of the Smilacaceae plant family. It comprises ca. 262 species distributed throughout the tropical, subtropical, and temperate regions of the world. It is characterized as climbing vines that often show prickles on the stem and paired petiolar tendrils. Known for its medicinal importance, the genus is also commercially used as a flavoring agent in foods, beverages, and pharmaceuticals (Figure 6). In traditional medicine, rhizomes are used as anti-inflammatory, antihypertensive, antirheumatic, antifungal, anti-pruritic, antiseptic, healing, diuretic, and tonic. However, the identity of the genus *Smilax* is often difficult due to the close morphological similarity leading to adulteration practices.

Against this background, the present work is being carried out with the objectives to (i) revise the taxonomy of Smilacaceae in India, (ii) understand the morphological evolution and diversification of the genus *Smilax* in the Himalayan region, and (iii) to develop DNA super-barcodes of the important Indian *Smilax* species using phylogenomic data.

For collection of *Smilax* species, a field tour to Darjeeling area was conducted and leaf samples of some important *Smilax* species were collected. Review of the taxonomic literature and multiple herbaria revealed absence of holotypes for four *Smilax* names. Hence, lectotypification was done for four names viz. *Smilax megacarpa* A. DC., *S. kingii* Hook.f., *S. gigantea* Merr., and *S. tetraptera* Schltr. (Figure 7).



**Figure 6**

Medicinally important *Smilax zeylanica* L. found growing at Mulshi area in Maharashtra (inset: fruits)

**Figure 7**

Lectotypes of *Smilax megacarpa* A. DC., *S. kingii* Hook.f., *S. gigantea* Merr., and *S. tetraptera* Schltr.



*Smilax megacarpa* A. DC.



*Smilax kingii* Hook.f.



*Smilax gigantea* Merr.



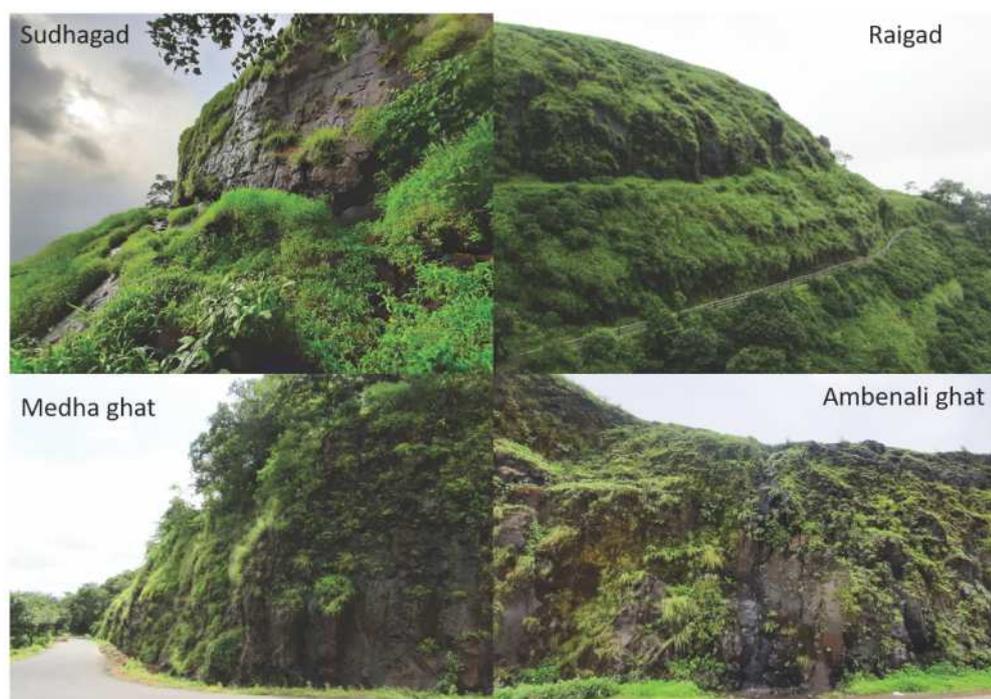
*Smilax tetraptera* Schltr.

## Understanding relationship between vegetation and rock type

Rock outcrops are one of the prominent habitats in the Western Ghats, located at various elevations. High elevation outcrops are composed of two lithotypes with distinct geological origins, viz. basalt mesa, and ferricretes. We examined the relationship between environmental factors, soil chemistry, and plant functional type abundance on these two distinct lithotypes. We recorded one hundred and twenty-seven taxa from 128 quadrats from 16 high elevation rock outcrops by sampling the outcrops in monsoon during peak flowering. The plant species were grouped into seven functional types, from which Graminoids and Therophytes were dominant across both the lithotypes. Overall, we observed a marginal difference in the vegetation across the two lithotypes where seasonal environment and soil nutrients also play a significant role in determining the composition of plants.

## Exploring vegetation on vertical cliffs, a neglected habitat

In India, cliffs or vertical rock faces composed of basalt in the northern Western Ghats (NWG) are the predominant rock outcrop. Due to their typical geological structure and inaccessibility, cliffs are often neglected as a habitat. Cliffs support diverse, rare, and endemic flora and fauna despite them being steep vertical landforms. To understand the cliff flora, we quantitatively sampled cliff habitats across the northern Western Ghats on hill forts and hill passes (Figure 8) in the last three monsoons. We recorded 240 taxa belonging to 150 genera and 46 families, of which 63 are endemic species. We also studied water and soil chemistry and their nutrient analysis composition to predict the relationship between cliff vegetation and its environment.



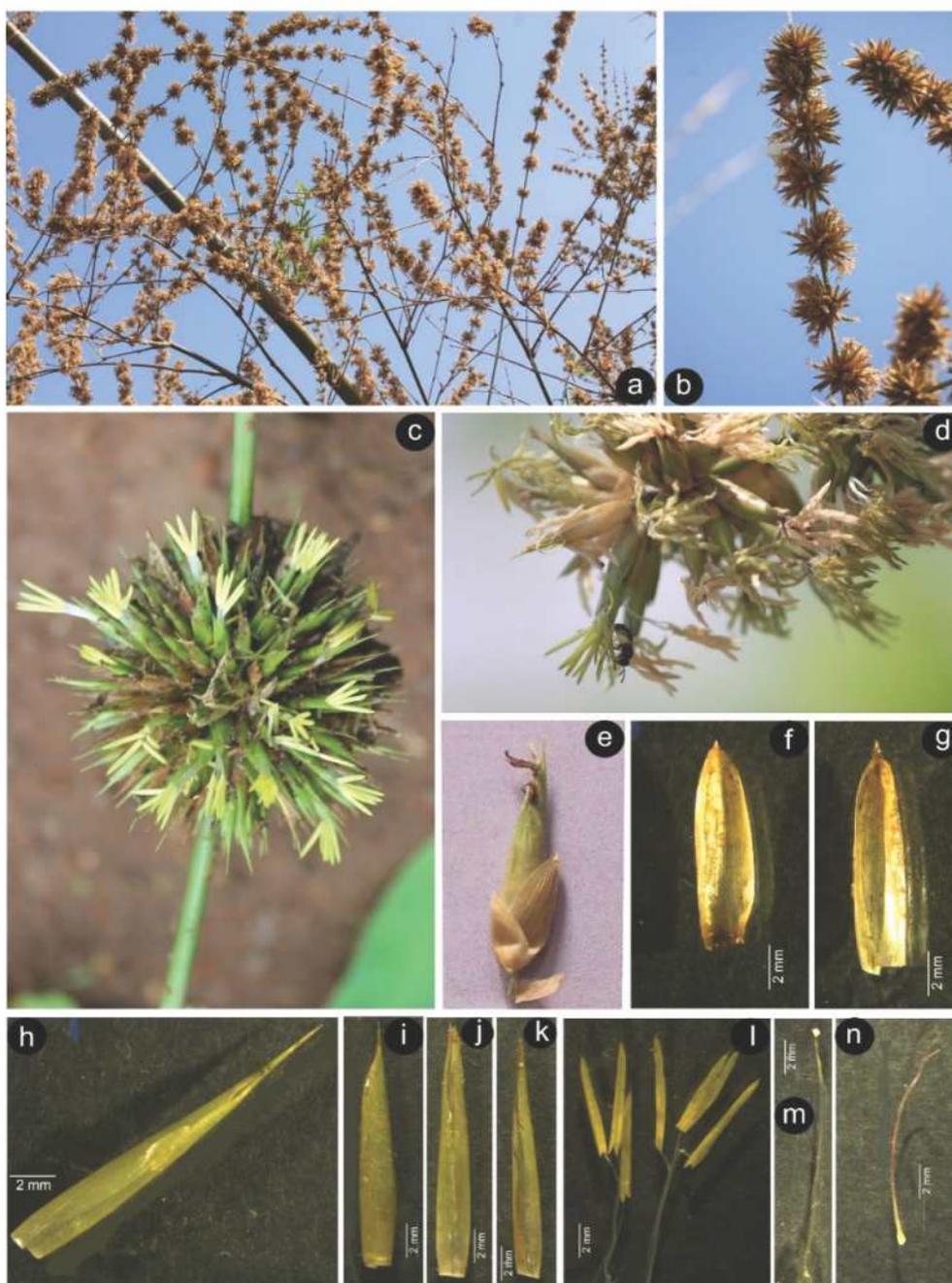
**Figure 8**

Cliff systems from Northern Western Ghats studied during the work

## A new species of woody bamboo discovered from the northern Western Ghats

In the northern Western Ghats, the two vernacular names of a bamboo species namely *Mes* and *Manga* were misapplied with one botanical name *Pseudoxytenanthera stocksii*. The confusion essentially occurred due to limited field studies in the region and the non-availability of bamboo flowering for critical studies. A bamboo

clump of *Mes* was located in flowering in the Panshet area of the Pune district. After critical studies of specimens and field observations, we described *Mes* as a new species, *Pseudoxytenanthera madhavii* (Figure 9). This specific epithet is given in honor of the eminent Indian ecologist Prof. Madhav Gadgil. The species is well known to the local inhabitants of the northern Western Ghats and effectively used for construction purposes. The discovery of this species is significant because the northern Western Ghats is a bamboo-starved region. Moreover, the species description is based on the local name, highlighting the urge to conserve the traditional wisdom.



**Figure 9** *Pseudoxytenanthera madhavii* P.Tetali, Datar, S.Tetali, Muralidharan, and R.K.Choudhary. a. flowering culm, b. flowering branch, c. pollen collector solitary bee, d. inflorescence, e. spikelet, f. lower glume, g. upper glume, h. upper lemma, i. lower lemma, j. upper palea, k. lower palea, l. apiculate stamen, m. staminal tube, n. gynoecium with hairy style and purple stigma

## Water quality rivers and streams of Northern Western Ghats

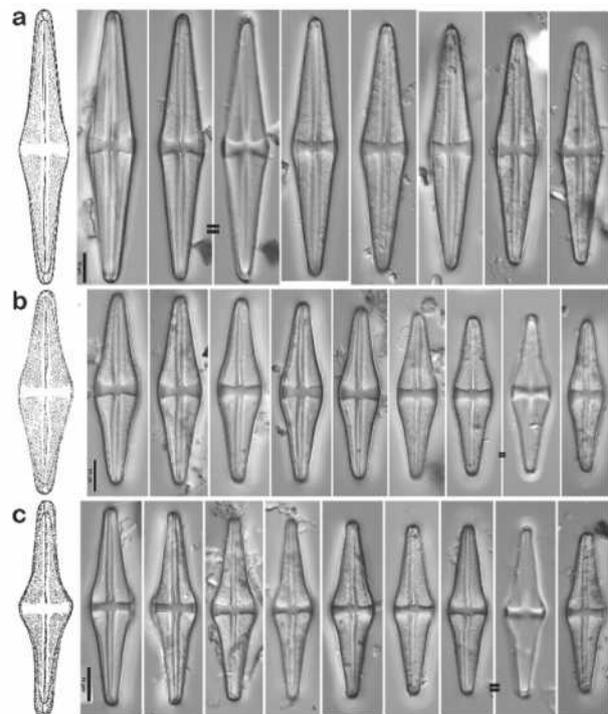
Diatoms play a crucial role in the functioning of streams and rivers. Their sensitivity to many environmental factors has led to the development of numerous diatom-based indices used in water quality assessment. Diatom samples and water quality parameters such as (pH, Electrical conductivity, Nitrate, Phosphate, and Temperature) have been tested from 50 sites of the streams and rivers. We found 111 dominant diatom taxa belonging to 45 genera. We have observed many pollution tolerant diatoms from urban sites compared to the semi-urban area. In decreasing order of abundance, the dominant diatom species were *Nitzschia palea*, *Gomphonema parvulum*, and *Gomphonema gandhii*. The most common clean water species were *Achnanthis linanulum* and *Achnanthis initium*. The most tolerant species were *Nitzschia palea* followed by *Gomphonema parvulum*. Statistical analysis shows that electrical conductivity and phosphate drive the diatom communities. Our study demonstrated that environmental gradient drives the diatom community and diatoms are valuable bioindicators for monitoring the aquatic ecosystem.

## Water quality of freshwater lateritic plateaus of the Western Ghats, India

The temporary pools support high endemic biodiversity but are poorly documented in the Western Ghats. These pools are situated on outcrops at various altitudes of Western Ghats and are composed of different bedrocks such as laterite and basalt. The water chemistry, geographical position, and the role of bedrock in determining the water quality were analysed. This study revealed high variation in water quality variables such as pH, conductivity, and ionic contents. The ionic composition at lower elevational plateaus shows high variation. Rock type and precipitation are the two main factors influencing the ionic concentration.

## Revisiting/ Resolving *Stauroneis acuta* W. Smith complex from Western India reported by H.P. Gandhi

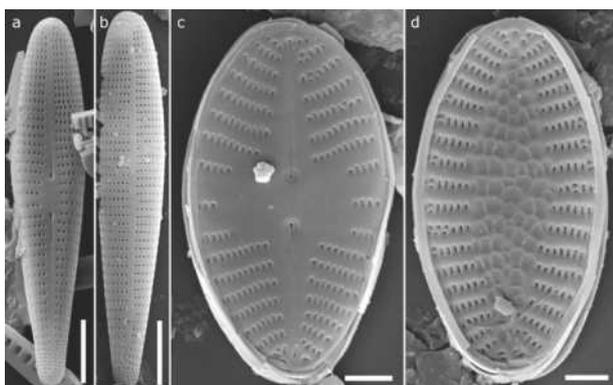
Among the naviculoid diatoms, *Stauroneis* Ehrenberg is known to have 1200 taxa with a worldwide distribution from polar to tropical habitats occupying aquatic to aerial habitats. In this genus, *S. acuta* is a cosmopolitan freshwater species described in Europe by W. Smith in 1853. DiatomBase lists 17 names, comprising 11 forms and five varieties of *S. acuta* from across all continents. From India, HP Gandhi reported *S. acuta* from the Western part of the country and described one infraspecific form (Figure 10). All of these taxa are known only from line drawings. Reinvestigation of these taxa with the help of the original material housed at (AHMA) Herbarium was carried out employing light and scanning electron microscopy. Results highlight the presence of three distinct and definable taxa. The study concludes the critical characteristics used in identifying species in *S. acuta* and its related taxa including: (1) shape and size of the axial area and stauros, (2) valve margins, (3) presence/absence of marginal ridge, and (4) stria density.



**Figure 10** Light Micrographs of *Stauroneis acuta* complex with its original line drawings documented by H.P. Gandhi (Gonzalves & Gandhi 1953a; Gandhi 1959a) a. *Stauroneis acuta* W. Smith b. *Stauroneis* sp. nov. c. *Stauroneis acuta* var. *tenuis* Gonzalves et Gandhi.

## The taxonomic novelty of diatoms in Sikkim, Eastern Himalayas

Sikkim lies within the Eastern Himalayan biodiversity hotspot located between Nepal and Bhutan. Diatoms are one of the least studied groups in the Eastern Himalayas, especially from the Sikkim region. The current study is inclined towards understanding the diversity of diatoms thriving in the aquatic and semi-aquatic environments. *Rhoicosphenia thiruvalanii* is described from an aquatic environment collected from the epilithic habitat of Tso Lhamo Lake at an elevation of 5126 m a.s.l (Figure 11 a-b). This species is known only from the type locality at a high elevation lake, suggesting it prefers cold oligotrophic waters. *Platessa arborea*, a monoraphid diatom species, is described from Sikkim's tree moss habitat (Figure 11 c-d). This is the first formal documentation of *Platessa* from the Indian region.



**Figure 11**

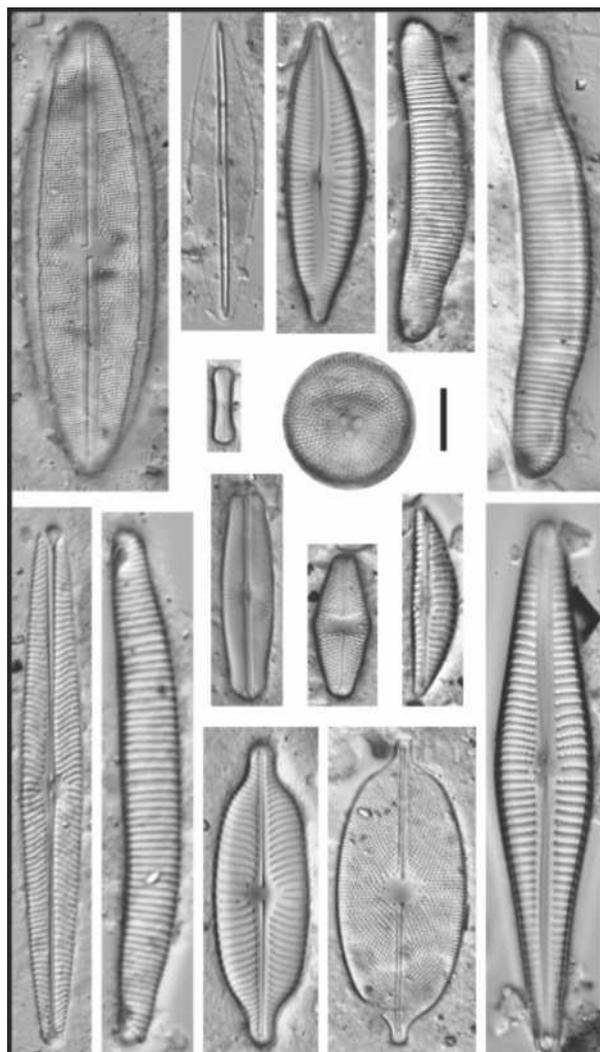
SEM images showing the new species of diatoms described from Sikkim. a-b) *Rhoicosphenia thiruvalanii*, c-d) *Platessa arborea*

## Unravelling the fossil diatom diversity inside the *Myristica* swamps of Southern Western Ghats, Kerala

The cell wall of diatoms is composed of silica (glass). When diatoms perish, this silica cell wall ensures their prolonged preservation inside the sediments. This fundamental characteristic makes diatoms a powerful proxy in palaeo-ecological studies. Diatom-based paleolimnological assessments from the Indian subcontinent are scarce, and diatoms from freshwater swamps have never been explored. In the present work, we tried to examine the diversity of diatoms in the palaeoarchives from *Myristica* swamps in the Southern Western Ghats region. An 80 cm long core was taken from the Muppathadi swamp in the Sastha Nada region in Southern Western ghats (Kerala). The sediment core retrieved was dated using  $^{14}\text{C}$  and covered a period of 4800

**Figure 12**

Plate showing fossil diatom diversity from the paleo-archives of *Myristica* swamps of SWG



years. The diatom analysis of 34 samples revealed more than 40 taxa from 16 genera. The highest number of species was observed from the genus *Eunotia*. The diatom assemblages were dominated by species like *Eunotia rhomboidea*, *Eunotia incisadistans*, *Eunotia bilunaris*, *Navicula globulifera* var. *robusta*, *Frustulia crassinervia*, *Gomphonema parvulum*, *Luticola mutica*, and *Sellaphora pupula* (Figure 12). Additionally, several other species belonging to the genera *Eunotia*, *Frustulia*, *Gomphonema*, *Navicula*, *Pinnularia*, and *Neidium* were present. Further, this preliminary work will be used as baseline information to establish the historical conditions of these swamps.

### **Characterization of lipids from the diatom *Gomphonema parvulum* (Kützing) Kützing**

Biofuels are known to be better than agri-based fuels owing to numerous benefits. *Gomphonema parvulum* (Kützing) Kützing, 1849, has been recognized as a cosmopolitan and ubiquitous diatom. It has been reported from a wide range of freshwater ecosystems and even in brackish water. *G. parvulum* (strain number c86), collected from Manipur, has been selected for this study. The pure culture was cultivated in the WC media in different stress conditions. After an incubation period, the lipid production was confirmed by confocal Microscopy using Nile Red staining. The diatom biomass has been collected using centrifugation. The lipids were extracted using the Folch method (Chloroform: Methanol) and stored at 4°C until further analysis. The quantitative and qualitative studies were done using gravimetry and GC-MS.

## **Palaeobiology**

### **Foraminiferal systematics using combined classical morpho-taxonomy, morphometrics and ribosomal DNA sequences**

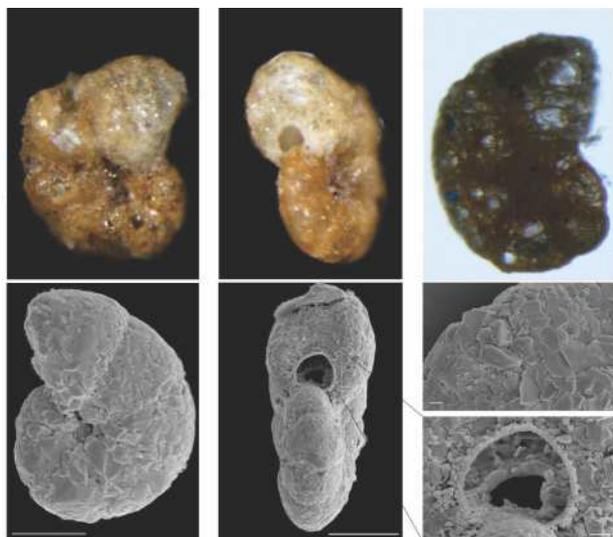
Foraminifera are single-celled, amoeba-like, eukaryotic protists. They are also known as armored-amoeba because they secrete a tiny shell (also known as test), which may be organic, agglutinated or calcareous, and their body size is usually less than one millimeter. The systematics of foraminiferans is based exclusively on the composition and the morphology of the test/ shell. The sizeable morphological variation observed in foraminiferal tests has made the species level identification particularly difficult. Recent advances in molecular phylogenetic studies in modern benthic foraminifers have enabled the ribosomal DNA based characterization using a single specimen of a species, and have provided more refined ideas about the interrelationship within the species, ecotypes, and lineages. Nearly 25 years after the first molecular investigation on foraminifera, the molecular systematic analyses on foraminifers are yet to start in India. Our work on integrated taxonomic approach using traditional morphology-based nomenclature employing high-resolution scanning electron microscope images, more than ten significant quantitative morpho-metric variables, rooted in DNA-based systematics, may help identify distinct morphological parameters to discriminate or identify a species of foraminifera, which may resolve many taxonomic related issues.

### **Description of a new genus and species of an agglutinated benthic foraminifer from the world's largest mangrove ecoregion, the Sundarbans, India**

*Srinivasania sundarbanensis* gen. et. sp. nov., is an agglutinated benthic foraminifer discovered from the Indian Sundarbans, Bay of Bengal. This new genus and species has a characteristic property of firmly sticking surrounding sediment grains towards constructing its outer armored test. In the *S. sundarbanensis*, the test is discoidal, measuring 100-350 µm in diameter with 6-7 chambers in the final whorl. The new genus has an agglutinated wall structure, planispiral coiled test, and a single high-arched equatorial aperture located at the base of the final chamber with a narrow, agglutinated lip and with morphological similarity to the genera

*Gobbettia* Dhillon and *Haplophragmoides* Cushman. However, our phylogenetic analyses, using partial small subunit rRNA gene, partial large subunit rRNA gene, and concatenated (LSU +SSU) sequences data clearly show the placement of this new taxon among other textulariid foraminifers, distant from all other genera in a strongly supported clade. Elemental characterization (SEM-EDS) of the agglutinated test wall of *S.*

*sundarbanensis* reveals a preference for quartz grains (SiO<sub>2</sub>) to construct its outer test. It is a common species and is presently known only from the northern marsh environments of Indian Sundarbans. This is the first ever discovery of a new genus of foraminifera from the Sundarbans (Figure 13).

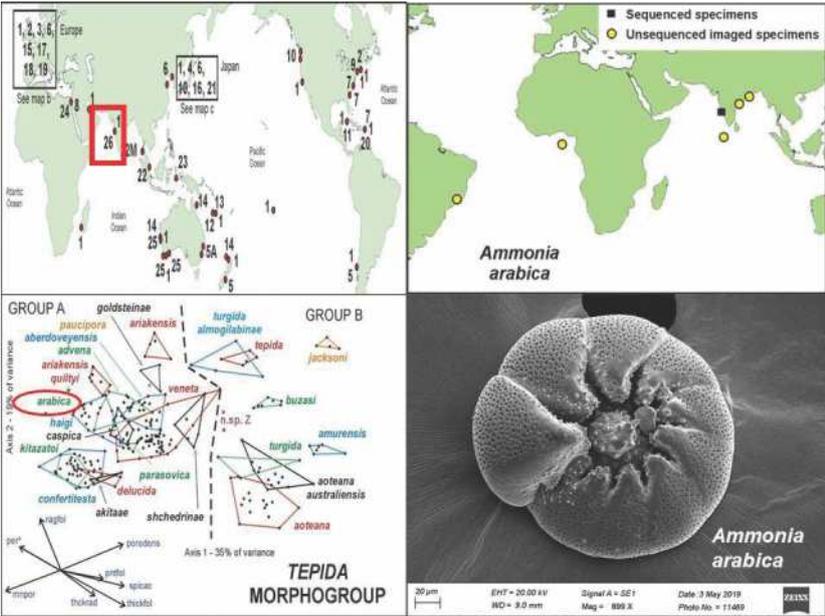


**Figure 13** *Srinivasania sundarbanensis* gen. et. sp. nov., a new agglutinated benthic foraminifer from the world's largest mangrove eco-region, the Indian Sundarbans (Source: Kaushik et al, 2021; Journal of Foraminiferal Research)

### Taxonomic reassessment of the recent (living) *Ammonia* (Foraminifera) from coastal Maharashtra and worldwide using morpho-taxonomy, morphometry and molecular tools

*Ammonia beccarii* was one of the first four foraminiferal species ever named (in the cephalopod genus *Nautilus* by Linné, 1758) and is the oldest available species name in the genus *Ammonia*. It is the type species of the genus and the species name that has been most widely used and misused worldwide. Unfortunately no type specimens existed for over 250 years and no type locality was specifically designated. Vaiani et al. (2019) selected a lectotype from Beccari's original Pleistocene samples. This morphotype is characterised by highly ornamented spiral and umbilical sides with flattening of the test in larger adult specimens – a combination of features not common in other *Ammonia* morphospecies. In the decades up until 1970, approximately thirty recent species and infraspecies attributable to *Ammonia* were named and described (initially in the genus *Rotalia* and later *Streblus*). Some workers preferred to identify only one or two species globally (lumpers), whereas others (splitters) argued that there were numerous distinct species. It was because of this environment of taxonomic uncertainty that several extensive studies were undertaken in the 1970s-1980s. Such tendencies have resulted in generation of tantamount names and imprecise species descriptions in genus *Ammonia*. For three decades, the recognition of just a single species *Ammonia beccarii* was embraced by most workers because it was an easy solution to what previously had been a very difficult task of trying to discriminate morphospecies of *Ammonia*. With the advent of molecular studies in foraminifera in the 1990s, it soon became clear that previous conclusions were incorrect and that there were indeed many different molecular and morphospecies of the genus *Ammonia*, both globally and often many in one region and/ or one locality. In this study we recognise, describe and figure sixty-seven living species and infraspecies of recent *Ammonia* and four closely-related genera from around the world and summarise their ecological and biogeographic distribution. *Ammonia arabica* sp. nov., a rotaliid benthic foraminifer was discovered from the Arabian coast of India. The species is distinguished based on its small biconvex test (0.2–0.3 µm). The new species was previously considered as an ecophenotype of *Ammonia beccarii*. However, our phylogenetic

analyses, using partial small subunit rRNA gene and partial large subunit rRNA gene sequences data clearly show the placement of this new species among other *Ammonia*, and distant from all other species/ subspecies in a strongly supported clade. This new species is assigned a genetic variety code 'T26', using T-type nomenclature, and is only reported from the Northern Indian Ocean, suggesting novel adaptation to differing ecological environmental conditions. The presence of new variety will add more insight into the genetic diversity of *Ammonia* from different geographic locations worldwide. This is the first ever discovery of new species of *Ammonia* from India (Figure 14).



**Figure 14**  
*Ammonia arabica* sp. nov., T26, discovery of a new species in genus *Ammonia* from the Arabian coast of India using integrated morphological, morphometric and molecular data (source Hayward et al., 2021, Micropaleontology)

# Bioenergy

## Biohydrogen production from alkali-treated rice straw using a defined consortium in bioreactor

Continuous biohydrogen production was performed in 2 L bioreactor (Figure 15). Defined microbial consortium of five obligate anaerobic bacterial cultures viz. *Clostridium chromiireducens* strain CTS0513, *Clostridium chromiireducens* strain STS0514, *Clostridium chromiireducens* strain XTS0511, *Clostridium diolis* strain STS0519 and *Clostridium diolis* strain XTS0513 were utilized for hydrogen production from rice straw. Continuous biohydrogen production was operated in a 2 L reactor for 70 days. An average yield of 66 ml hydrogen g<sup>-1</sup>TS fed was obtained over a period of 60 days of operation in continuous mode. The VFA analysis

showed production of acetic acid, propionic acid, butyric acid, valeric acid and caproic acid during the operation of the reactor. Production of volatile fatty acids and organic acids in specified range eliminate or reduce the effect of homoacetogenesis in the process of hydrogen production.



**Figure 15**

Set up for biohydrogen production in bioreactor

## SRB-lytic bacteriophage mediated inhibition of SRB growth and H<sub>2</sub>S in contaminated water samples from oil fields

We have developed a bio-control process for inhibition of Sulphate reducing bacteria (SRB), which is an effective, inexpensive, and environmentally benign process.

SRB produce hydrogen sulfide (H<sub>2</sub>S) as part of the sulphate metabolism. They are present in the oil reservoirs, and adversely affect crude oil quality. In addition, SRB indirectly corrodes iron construction due to H<sub>2</sub>S. Current mitigation strategies to control SRB and SRB-mediated corrosion are cost-intensive and have limited effect on SRB inhibition. Different water samples were screened for the presence of SRB-lytic bacteriophage. SRB-lytic bacteriophages were isolated using the plaque assay technique. Field emission gun transmission electron microscopy (FEG-TEM) revealed that the bacteriophage belongs to the *Podoviridae* family of viruses.

An experiment was performed to determine the activity of SRB-lytic bacteriophage on the indigenous population of SRB in contaminated samples collected from oil fields. After 16 days of incubation, H<sub>2</sub>S in control (without bacteriophage) reached 0.085 %, while in test (with bacteriophage) it was 0.043 % (Figure 16). The SRB count was enumerated by RT-qPCR method, a one-log reduction in SRB count was observed in the test compared to control.

**Figure 16**

Reactors displaying the inhibitory effect of SRB-lytic bacteriophage on indigenous SRB in formation water samples collected at ONGC, Uran



### Applications of methanotrophs

Biological processes of microbial origin can be used to tap energy-rich resources through the development of interlinked and self-sustaining bio-refinery means. We propose to develop a bio-refinery process that will use a chain of multiple processes similar to bionetworks where the product of one process will be used as starting material for the other process, ultimately producing multiple biofuels and value-added products in related processes. Methanotrophs are one such group, where methane from biogas or landfill gas would be used to make value added products such as bioplastics (PHB granules), anti-oxidants (carotenoids) and novel biofertilizers or bio-inoculants. We demonstrated the production of PHB granules using methanotrophs, and found maximum potential in Type II methanotroph strains. Carotenoid production was seen in case of Type I methanotrophs, and the extracted carotenoids are being studied further. We also used ten methanotroph strains as bio-inoculants for rice cultivation in pot experiments. One of the methanotrophs induced early flowering followed by early grain formation and maturity (*Methylococcus oryzae* strain BM10) (Figure 17). Most of the methanotrophs either had a positive or neutral effect on the growth of the rice plant indicating their potential as plant growth promoting agents. All of the ten strains used showed nitrogen fixation pathways in their genomes.



**Figure 17**

Early flowering followed by grain formation and grain maturation was seen in case of *Methylococcus oryzae* strain BM10 (left pot) inoculated pot compared to the plants in the control plot (right pot)

# Bioprospecting

The focus of research is on the isolation and synthesis of naturally occurring compounds, derivatives and their use in pharmaceuticals, nutraceuticals, agriculture and industries. We also try to understand the mechanistic approach of these compounds for disorders such as Alzheimer's disease, anemia, diabetes, cancer, and chikungunya virus.

## Natural Product Chemistry

### Fungi

#### Biopigment from a rare fungus

A secondary metabolite, the biopigment from a rare fungus *Gonatophragmium triuniae* was isolated and identified based on the morphological and phylogenetic analysis. The crude extract obtained after fermentation of *G. triuniae* has shown antioxidant and antibacterial activity. Besides, dyeing of cotton fabric mordanted with FeSO<sub>4</sub> using this crude pigment was found to be satisfactory, suggesting its possible application in the textile industry. The orange pigment was purified and characterized as "1,2-dimethoxy-3H-phenoxazin-3-one" (C<sub>14</sub>H<sub>11</sub>NO<sub>4</sub>, m/z 257) using preparative HP-TLC, UV-Vis, FTIR, HRMS and NMR (<sup>1</sup>H NMR, <sup>13</sup>C NMR), COSY, and DEPT analyses.

To our understanding, this is the first study reporting antioxidant, antibacterial, and dyeing potential of crude extract of *G. triuniae*, suggesting possible potential applications of pigments and other bioactive secondary metabolites in textile and pharmaceutical industry.

Besides, more than 50 *Fusarium* isolates were screened for the presence of beauvericin (BEA) which is a cyclic hexadepsipeptide that consists of alternating D-2-hydroxyisovaleric acid and N-methyl phenylalanine. In this study about 25 indigenous *Fusarium* isolates showed BEA production which were confirmed using TLC, HPLC and HRMS analysis.

### Lichen

#### Lead compounds from natural resources

Morpho-anatomic and chemotaxonomic (TLC) studies of over 30 lichen specimens collected from forest localities of Western Himalaya were conducted. Of these, six lichen species *Nephromopsis laii* (Lichenosterinic/Protolichenosterinic acid), *Stereocaulon foliolosum* (Atranorin, Lobaric acid), *Cladonia furcata* (Fumarprotocetraric acid), *Flavopunctelia flaventior* (Lecanoric acid), *Cetrelia pseudolivatorum* (Olivetoric acid) and *Parmotrema tinctorum* (Lecanoric acid) have been selected on the basis of their therapeutic effects on various diseases in the traditional system of medicine in order to find out possible candidate/ lead compounds from natural resources.

To study the chemo-taxonomy of lichens, authentication of lichen compounds is being done using TLC, HPLC and Wintabolites software. Polyphenol, polysaccharide and protein content of the six species were determined by using standard methods. It was observed that acetone extracts of *P. tinctorum* showed presence of high amounts of phenolic compounds and protein content. Methanolic extract of *P. tinctorum* and ethyl acetate extract of *S. foliolosum* have shown presence of high amounts of polysaccharide contents.

Antioxidative potential of crude extracts of lichen species *Cetrelia pseudolivatorum*, *Cladonia furcata*, *Flavopunctelia flaventior*, *Nephromopsis laii*, *Parmotrema tinctorum* and *Stereocaulon foliolosum* was evaluated for antioxidative capacity in terms of DPPH free radical scavenging and FRAP - ferrous reducing antioxidative potential. Water soluble acid of Vitamin-E also known as Trolox is used as the reference standard ( $IC_{50}$  value 4.49  $\mu\text{g/ml}$ ).

Ferric reducing activity was tested of various lichen extracts using Ferric Reducing Antioxidant Potential Assay. Significant activity with 50% inhibition concentration at 41.59 to 66.67  $\mu\text{g/ml}$  was shown by acetone extracts of *S. foliolosum*, *C. pseudolivatorum*, *F. flaventior*, *N. laii*, and *P. tinctorum* respectively.

As far as the antimicrobial activity of lichen species *Cladonia furcata*, *Flavopunctelia flaventior*, *Nephromopsis laii* and *Stereocaulon foliolosum* is concerned, antibacterial activity was tested against bacterial strains; *Pseudomonas aeruginosa* (MTCC 2453) and *Raoultella planticola* (MTCC 530).

Significant antibacterial activity was observed against *P. aeruginosa* bacteria by *F. flaventior* acetone extract, having a MIC value of 15.625  $\mu\text{g/ml}$ . Methanolic extracts of *F. flaventior*, *S. foliolosum*, and *C. pseudolivatorum* and acetone extract of *S. foliolosum* have shown a minimum inhibitory concentration of 31.25  $\mu\text{g/ml}$  against bacteria *P. aeruginosa*. Extracts of *C. furcata*, *F. flaventior*, *N. laii*, *S. foliolosum*, *P. tinctorum* and *C. pseudolivatorum* showed activity against *R. planticola* with a MIC value of 62.5  $\mu\text{g/ml}$ . Ethanolic extracts of *C. furcata*, *N. laii* and *S. foliolosum* show minimum inhibition at 125  $\mu\text{g/ml}$  against *R. planticola* bacteria. Streptomycin was taken as standard which has shown bacterial inhibition at 3.9 and 7.8  $\mu\text{g/ml}$  against *R. planticola* and *P. aeruginosa* respectively.

Two secondary metabolites, Lecanoric acid and Salazinic acid were isolated from the lichen species by PTLC and further confirmed with HPLC analysis. We have reviewed the traditional knowledge of the lichen species and biological activities to study the interrelationship.

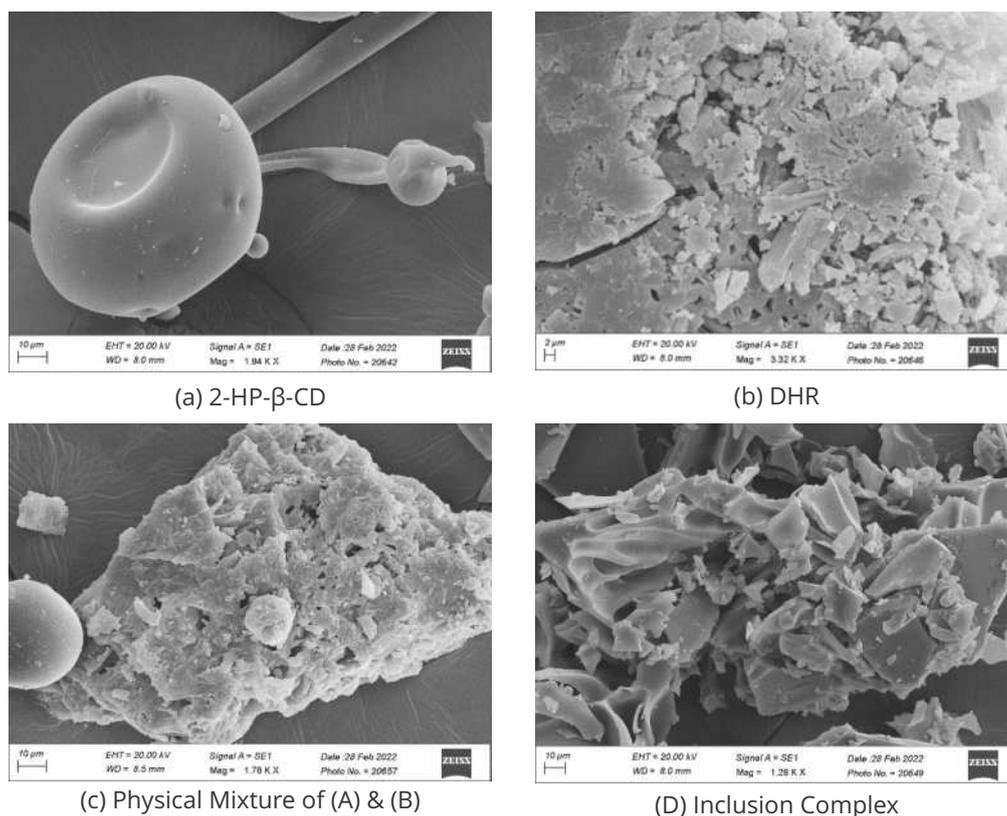
### Synthesis of dihydrorugosaflavonoid analogs and their encapsulation with $\beta$ -cyclodextrin

Dihydrorugosaflavonoid (DHR), which is an analog of Rugosaflavonoid A has been synthesized again with our previously reported method for further studies. Halogenated analogs of dihydrorugosaflavonoid have potential against *Mycobacterium tuberculosis* and Chikungunya. Based on their potential we tried to enhance their solubility and efficacy study via encapsulation with 2-hydroxypropyl- $\beta$ -cyclodextrin (HP- $\beta$ -CD).

The objective of the study is to encapsulate the halogenated dihydrorugosaflavonoid molecule into the HP- $\beta$ -CD binding cavity. The inclusion complex (IC) was synthesized by the freeze-drying method. The (HP- $\beta$ -CD) effect on the DHR solubility was determined through phase solubility studies. A phase solubility diagram determines the stoichiometry of the equilibrium or ratio between the solubilizing agent and drug in the complex and also allows the determination of the apparent stability constant ( $K_s$ ). The increasing DHR solubility was a linear function of the HP- $\beta$ -CD concentration (0-12 mM), which is related to the AL type curve and indicative of the 1:1 stoichiometry ratio between DHR and (HP- $\beta$ -CD) in the IC. The stability constant ( $K_s$ ) of the DHR/ HP- $\beta$ -CD IC is 1,774.31  $\text{M}^{-1}$  which indicates the formation of a stable inclusion complex.

In addition, the negative value of Gibbs free energy  $-18.54 \text{ KJ mol}^{-1}$  demonstrates the spontaneity of the complexing process with HP- $\beta$ -CD and suggests that the HP- $\beta$ -CD solution could offer a favorable environment for DHR.

Morphological evaluation of Inclusion Complexes: Scanning Electron Microscopy is the most important method to investigate the morphologies of pure CDs as carriers and guest molecules as ICs. The micrographs of pure host and guest molecule along with physical mixtures of host and guest molecule and IC are illustrated in Figure 18.



**Figure 18**

SEM images of a) HP- $\beta$ -CD; b) DHR; c) Physical mixture DHR and HP- $\beta$ -CD; d) Inclusion Complex of HP- $\beta$ -CD and DHR

### In vitro and in vivo anti-inflammatory activity of *Tetragium sulcatum* leaf extracts, pure compound and its derivatives

We demonstrated the topical anti-inflammatory potential of the crude ethanolic extract of *Tetragium sulcatum* leaves and its fractions in our earlier studies. We further explored the anti-inflammatory activity of *T. sulcatum* extract, fractions, pure compound, and its derivatives using *in vitro* and *in vivo* bioassay techniques. We attempted to isolate a pure compound from the leaf extract and identified it as a Friedelan-3 $\beta$ -ol. Furthermore, Friedelinol acetate and friedelinol methyl ether, derivatives of Friedelan-3 $\beta$ -ol, were synthesized.

Treatment with crude extract (TSETOH) and fractions (TSHEX, TSTOL) significantly reduced ( $p < 0.001$ ) the mRNA expression of pro-inflammatory cytokines (IL-1 $\beta$ , IL-6, TNF- $\alpha$ ) and nitric oxide (NO) production in LPS-stimulated inflammation in RAW 264.7 cells in a dose-dependent manner. Likewise, compounds CI and CIII

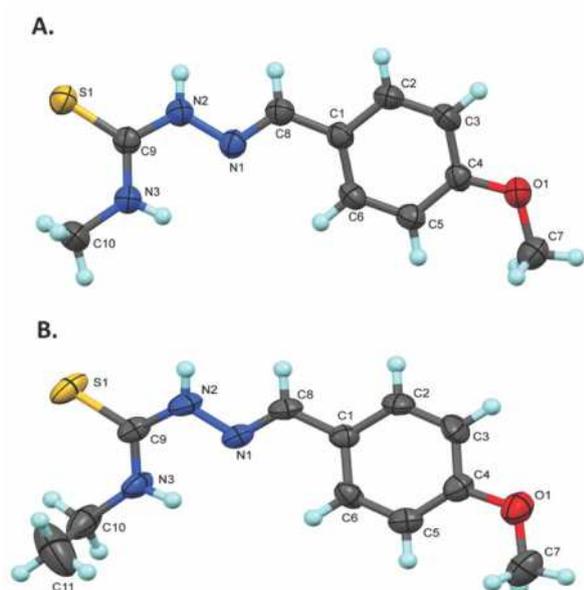
showed a similar pattern of significant inhibition ( $p < 0.001$ ) of pro-inflammatory cytokines and NO production in a dose-dependent manner. Inflammation-induced oxidative damage was found to be restricted significantly ( $p < 0.001$ ), with scavenging activity and increased SOD activity of crude extract and fractions. An *in-vivo* study in a carrageenan-induced mouse paw oedema model demonstrated reduced paw oedema and pro-inflammatory cytokines in a dose-dependent manner upon treatment with the extract, its fractions, pure compound and their derivatives. The present study confirmed the anti-inflammatory activity of *T. sulcatum*, suggesting that Friedelan-3 $\beta$ -ol is an active component of the crude extract.

## Medicinal Chemistry

### Studies on alkyl substituents on the anti-Alzheimer's disease activity of 4-methoxybenzaldehyde thiosemicarbazone derivatives

Alzheimer's disease (AD) is a multifactorial brain disorder that involves several pathophysiological events like amyloidogenesis, acetylcholine deficit, neuroinflammation, cellular oxidative stress and dysfunctional autophagy. Hence, to cure AD, it is necessary to target multiple mechanisms involved in the development and progression of AD.

We report the synthesis of novel multifunctional 4-methoxybenzaldehyde thiosemicarbazone derivatives by simple condensation of 4-methoxybenzaldehyde with substituted thiosemicarbazone and their biological activities. The crystal structures of these novel compounds viz. (2E)-2-[(4-methoxyphenyl)methylidene]-N-methylhydrazine-1-carbothioamide (MZMT) and (2E)-N-ethyl-2-[(4-methoxyphenyl)methylidene]hydrazine-1-carbothioamide (MZET) are also reported. The crystal analysis showed that both MZMT and MZET crystallize within the orthorhombic crystal system within the space group Pbc<sub>a</sub>. The asymmetric unit cell of both MZMT (Figure 19 A) and MZET (Figure 19 B) consists of eight molecules.



**Figure 19**

ORTEP diagrams of A) MZMT and B) MZET

We carried out molecular docking analysis for studying the interactions of TSC derivatives with acetylcholine esterase (AChE). In vitro AChE inhibitory potential of 4-methoxybenzaldehyde TSC derivatives was also determined as compared to a standard inhibitor of AChE viz., galantamine. Our data showed that MZMT and MZET effectively interact with CAS as well as the PAS region of AChE respectively.

The up-regulation of autophagy is a desirable approach for the autophagic clearance of aggregated proteins, viz.,  $\beta$ -amyloid peptides, and tau, which are the targets for AD therapeutic interventions. Herein, the potential of MZMT and MZET to regulate autophagy was studied using a stable SH-SY5Y cell line expressing mCherry-GFP-LC3 gene. The control cells show diffuse fluorescence in the cytoplasm due

to presence of LC3 protein. Rapamycin, an autophagy inducer, was used as a positive control. Rapamycin treatment caused a strong induction of autophagy as seen by abundant LC3 fluorescent puncta. When these cells were treated with MZMT and MZET, the LC3 protein is seen on the membranes of autophagosomes and autolysosomes as indicated by yellow and red puncta, respectively. Treatment of neuroblastoma cells with MZMT and MZET resulted in the formation of more red puncta than yellow puncta, which indicated their potential to induce autophagy. There was a significant increase in the number of autolysosomes in MZET-treated cells, which again indicated the importance of the ethyl group at the thioamide position of TSC moiety in the synthesized TSC derivatives. Overall, the results showed that the treatment of SH-SY5Y neuroblastoma cells with MZMT and MZET increased the rate of autophagic flux and emphasized the role of increased chain length of substituent on TSC moiety on autophagy induction.

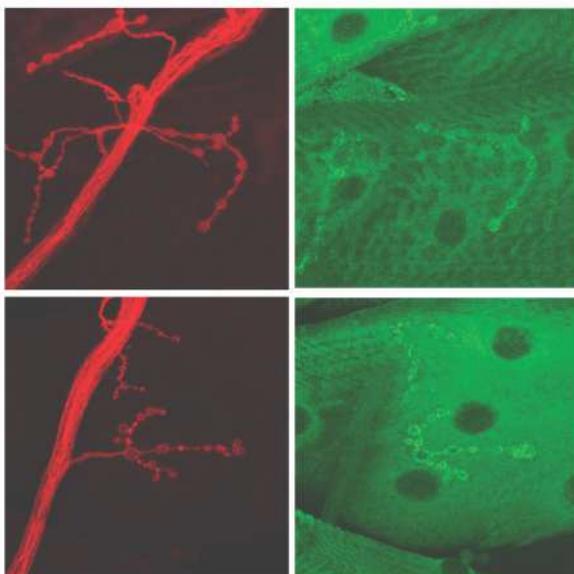
# Developmental Biology

Model organisms including zebrafish, drosophila, and hydra are used to study cellular signaling and morphogenesis during development. We combine genetics with molecular biology and imaging in our studies.

## Exploring anterograde mechanisms regulating glutamate receptor abundance at the synapse

The *Drosophila* 3<sup>rd</sup> instar larval neuromuscular junction is a well-established model to understand mechanisms driving synaptic development, function and homeostasis. These synapses use glutamate as a neurotransmitter, a feature similar to the central synapses in vertebrates. Glutamate receptors are tetramers made up of four subunits. Of these, three are invariant; the fourth subunit is either GluRIIA or GluRIIB (Figure 20). Thus two types of receptor clusters exist which differ in their conductance properties. We have previously identified a role for Mon1 in regulating GluRIIA in a trans-synaptic manner. To gain insight into anterograde

mechanisms that regulate post-synaptic receptor levels, we have conducted a targeted reverse genetic screen. Preliminary findings have identified 3-4 molecules that modulate receptor levels at the nmj. These target molecules will be validated further to gain a mechanistic insight into the mode of receptor regulation.



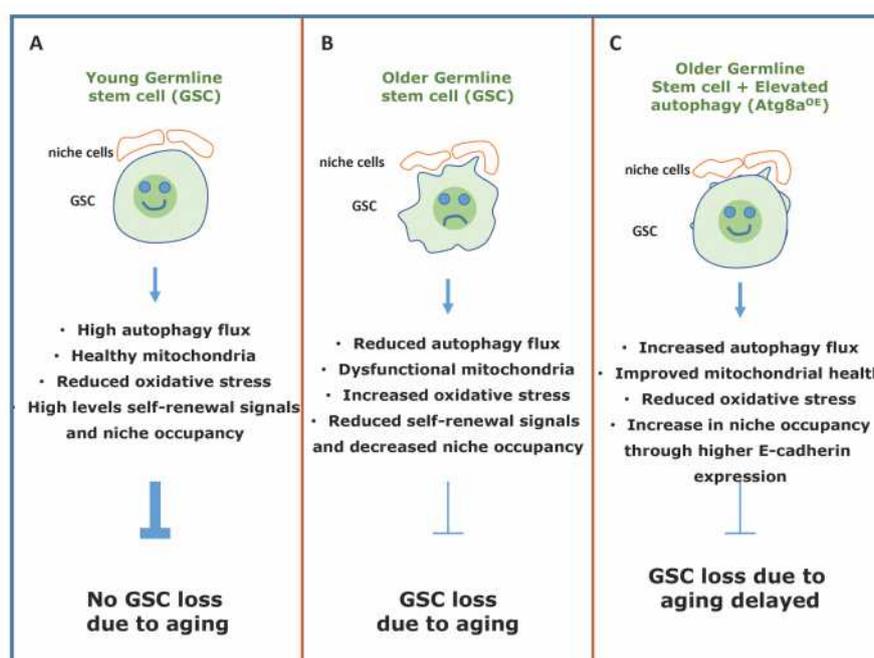
**Figure 20**

(A-B) Control (A) and experimental Synapse (B) stained with anti-HRP (red) and GluRIIA (green). Note the increase in GluRIIA in (B).

## Elevated autophagy promotes germline stem cell maintenance and activity and delays their ageing in drosophila

In metazoans, the production of gametes depends on the activity of germline stem cells (GSCs) located in the gonads. GSCs are also subject to cellular damage that causes premature ageing leading to their depletion within the gonads. Autophagy is necessary during animal development and impaired autophagy has been implicated in ageing of stem cells including GSCs. However, the precise molecular role of autophagy in GSC ageing has not been elucidated. We use *Drosophila* female germline stem cells as a model to study the

molecular role of autophagy in germline stem cell ageing. Our data show that autophagy flux reduces with age and elevating autophagy flux specifically in GSCs through overexpression of Atg8a ( $Atg8a^{OE}$ ) increases autophagy flux. This leads to longer retention of GSCs and increased GSC divisions. In contrast, autophagy flux, GSC retention and activity are reduced when Atg8a function is compromised ( $Atg8aRNAi$ ). Mitochondrial size is smaller and mitochondrial oxidation is significantly reduced in  $Atg8a^{OE}$ . In contrast, the mitochondria exhibit increased oxidative stress and are larger in size in  $Atg8aRNAi$  expressing GSCs. Finally, our data show that  $Atg8a^{OE}$  GSCs occupy the stem cell niche for longer duration with the aid of elevated E-cadherin at the GSC-cap cell contact sites. Taken together, our data suggests that autophagy promotes GSC maintenance and activity, and delays their ageing through modulation of E-cadherin expression (Figure 21).



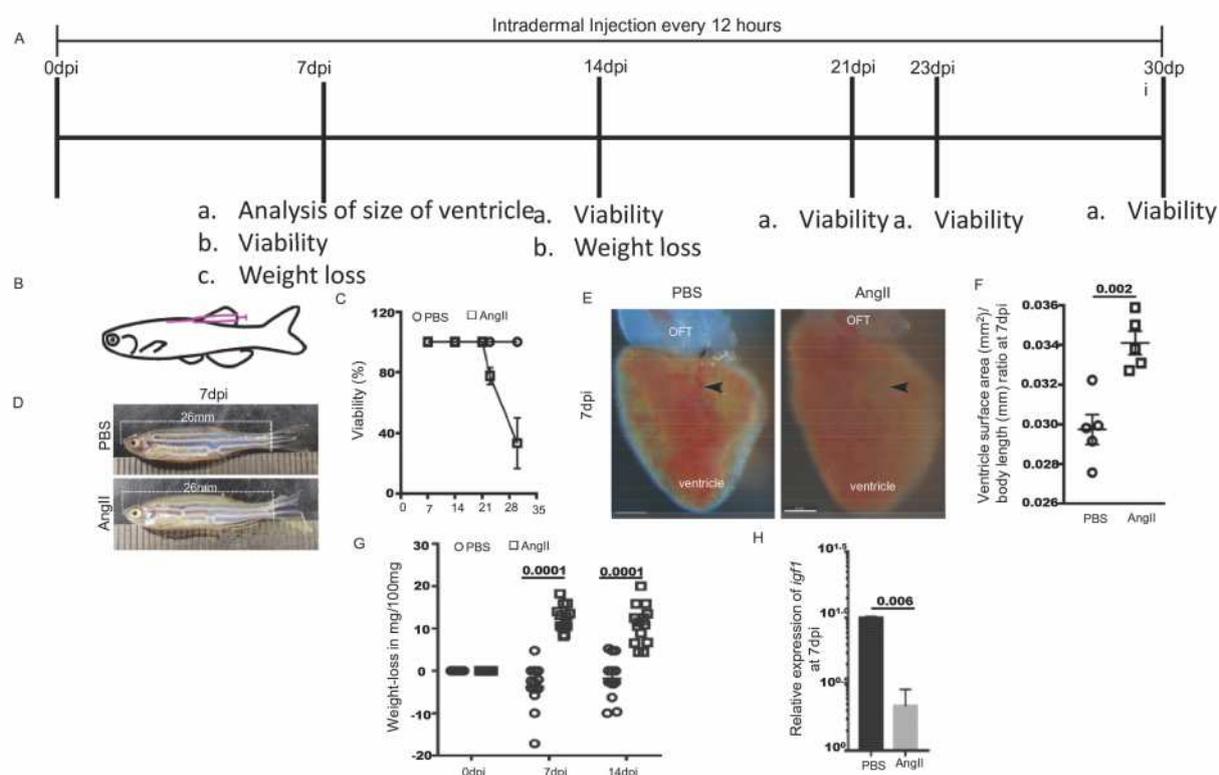
**Figure 21**

Autophagy levels are optimal and hence there is minimal oxidative stress, higher levels of self-renewal signals and hence minimal GSC loss due to aging in young GSCs. (B) In older GSCs, autophagy levels are severely reduced leading to accumulation of dysfunctional mitochondria and increased oxidative stress. GSC self-renewal signal are low leading to GSC loss. (C)  $Atg8a^{OE}$  (elevated autophagy) leads to better mitochondrial health and reduced oxidative stress. This improves GSC self-renewal through increased E-cadherin and therefore GSC loss due to aging is delayed significantly.

### Zebrafish model to study hypertension-mediated pathophysiology

Persistent hypertension or high blood pressure leads to cardiac remodelling involving hypertrophy, alteration of gene expression, extracellular matrix molecule deposition, and cardiac fibrosis. If left untreated it can lead to myocardial damage in the long term. The remarkable genetic, physiological, and anatomical similarities between humans and zebrafish allow us to investigate cellular and molecular mechanisms in organ development, disease, and regeneration leading to establishing novel therapies for human diseases. We developed a zebrafish model to study multifactorial pathophysiology in Ang-II mediated hypertension.

Our findings are as follows: AngII is an effector molecule of the Renin-Angiotensin system (RAS), which plays a crucial role in hypertension in mammals. In our study, AngII was injected intradermally at regular time intervals for a period of time. Our results show that similar to mammals, AngII induces fibrotic gene expression, collagen deposition, cardiomyocyte hypertrophy, and cardiac cell proliferation (Figure 22). Thus, we propose that zebrafish can prove to be a valuable model to study AngII-RAS pathway-mediated pathophysiology.



**Figure 22**

Intradermal Angiotensin II injection induces cardiac hypertrophy in adult zebrafish. (A, B) Diagrams showing experimental procedure (A) and sight of intradermal injection (B). (C) Survival assay assessed the viability of the PBS or AngII injected animals at different time points ( $n=18$  each from three independent experiments). Error bars indicate the mean  $\pm$  s.d. (D) Images of PBS or AngII injected zebrafish at 7dpi. (E) Bright-field images of cardiac ventricles isolated from PBS or AngII injected animals at 7dpi. Arrowheads indicate the atrioventricular canal. Scale bars, 200  $\mu$ m. (F) Statistical analysis of the ratio of the 2D surface area of the ventricle and body length of individual fish at 7dpi ( $n=5$  each from two independent experiments). (G) Quantitative analysis of weight loss in 14 PBS injected and 14 AngII injected zebrafish from 3 independent experiments. (H) Quantitative analysis of the expression of *igf1* in cardiac ventricles from PBS or AngII injected animals at 7dpi ( $n=3$ , each sample represents a pool of 6 hearts). Error bars indicate the mean  $\pm$  s.e.m. dpi, days post-injection; OFT, outflow tract. Significant,  $p<0.05$ ; non-significant,  $p\geq0.05$ .



# Genetics and Plant Breeding

ARI is engaged in improving the productivity and profitability of crops on an ecological and economically sustainable basis. The institute is one of the leading centres for improving crops such as wheat, soybean and grapes under the All India Coordinated Research Projects funded by the Indian Council of Agricultural Research, New Delhi.

## 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.

### **High density genetic linkage map in Indian durum wheat**

High density genetic linkage maps were generated in Indian durum wheat populations using 35K SNP markers. In PDW233/Bhalegaon-4 RILs, 1583 SNP markers were mapped with a high density of 2.8 cM/marker. Similarly, 951 SNPs were mapped in the MACS3125/UC1113 population with a high density of 4.8 cM/marker. These maps provide valuable genetic resources that represent the genetic architecture of modern as well as traditional Indian durum wheat. The maps will be used to identify genes responsible for micronutrient content in wheat.

### **Pyramiding of rust resistance genes into high grain quality wheat lines developed through marker-assisted selection**

The project aims to deliver newer versions of well adapted high yielding varieties as well as new improved genotypes combining superior grain quality and rust resistance with best possible agronomic performance. In previous seasons, recipient lines with improved quality parameters (MACS 2496 + Gpc-B1+Lr24 and NI 5439 + Gpc-B1+Lr24) were crossed with the donor for leaf rust resistance HD2967 (Lr19-Sr25+Lr34). In the subsequent progeny, plants with 3 genes were advanced to the F4 stage during the season 2021-22. About 174 plants with improved rust resistance and morphological traits were selected. Progeny of intercrosses carried out to achieve all 4 targeted genes (Gpc-B1, Lr34, Lr24 and Lr19) were advanced to the F2 stage and F3 seeds were harvested based on disease reaction and plant morphology. Wheat lines carrying high degrees of rust resistance will serve as a valuable genetic resource in wheat improvement programmes.

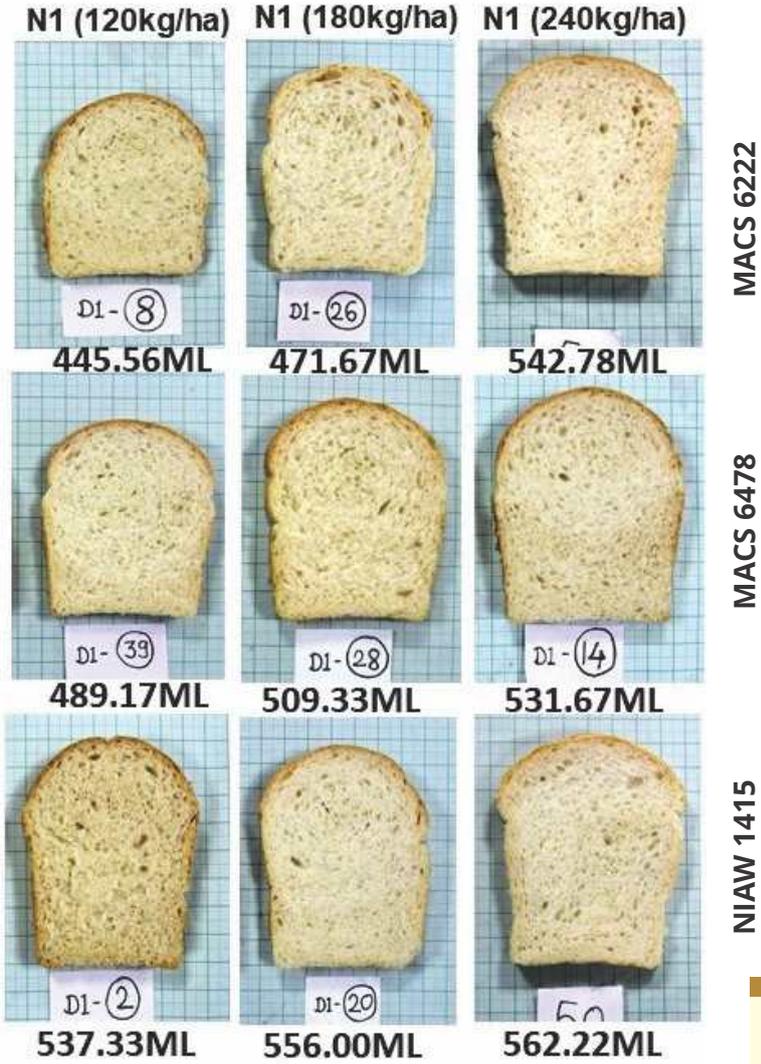
### **Improvement of biscuit making quality using MAS and mutation breeding**

A study has been initiated to improve the biscuit making quality of peninsular zone wheat varieties by reducing gluten strength. A mutant population of a hard grain textured bread wheat MACS 6478 is being screened to identify null allelic mutants for Glu-A1, Glu-B1 and Glu-D1 loci. Six null and one mobility shift

HMW-GS mutants for the three Glu-1 loci were identified using SDS-PAGE and confirmed using RP-HPLC technique. These mutants were grown for two consecutive years in a random block design and the wild MACS 6478 genotype. The harvest was analyzed for agronomic, physicochemical, and end-use quality traits. Mutants line M-1114 and M-1116 (null for HMW Glu 17Bx+ 18By) and M-1181 (null for HMW Glu 17Bx) have significantly lower values for the micro sedimentation test (MST), Swelling index of glutenins and SRCs tests. The preliminary results of biscuit making showed that few mutants showed a significant increase in biscuit spread factor. Crosses for pyramiding of all the Glu-1 null mutants to generate fewer HMW-GS containing/ null HMW-GS bread wheat were made, and F2-3 were obtained. They are expected to have low gluten content and low protein content leading to low gluten, low protein soft bread wheat. The two year grain yield data of these mutants showed similar agronomic properties as wild MACS 6478, but most mutants showed improved biscuit making properties than wild type. Development of allele specific primers for identified HMW null glutenin mutants and their use in marker-assisted breeding is underway.

**Influence of fertilizers, date of sowing and genotypes on wheat end-use quality**

The end-use quality largely depends on grain protein content and quality, which depends on the supply of nitrogen, sulphur nutrients, the environment, and genetics of the variety. An experiment was designed to test the effects of nitrogen, sulphur, date of sowing on end-use quality. Three different nitrogen doses, three



different sulphur doses with two different sowing dates and three different bread wheat varieties released for PZ were included. The initial results showed protein content largely depends on all three components, i.e. nitrogen, sulphur and variety, and their interaction. An increase in protein content enhances the gliadins and glutenins. Gluten strength as measured by microsedimentation is not affected by sulphur and nitrogen but largely depends on the genetic composition of the variety. This was also confirmed by mixograph dough development time (MPTmin) and bread loaf volume. Bread loaf volume was significantly ( $P < 0.05$ ) increased with an increasing dose of nitrogen for all three varieties (Figure 23).

**Figure 23**  
Effect of nitrogen fertilization on bread quality

## Alternative dwarfing genes for improvement of early vigour in semi-dwarf wheat

Alternative dwarfing genes Rht14 and Rht18 provide semi-dwarf stature while retaining long coleoptile and better seedling establishment traits, thereby helping in emergence of seedlings under stubble-retained and dry conditions. Such wheat cultivars will be less affected by left-over crop residues and limited moisture conditions making them ideal candidates for conservation agriculture. Rht18 is fine-mapped within an interval of 0.5 cM with SSR markers. The interval corresponds to a physical distance of 8 Mb on chromosome 6A, and carries 8 putative candidate genes showing differential expression in developing stems. Advanced breeding lines developed through marker-assisted introgression of Rht14 and Rht18 in Indian wheat varieties were sown in the field for evaluation. Selected lines will be a valuable eco-friendly resource to combat stubble-burning in rice fields, thereby reducing environmental pollution.

## Wheat Improvement

Wheat research at ARI aims to develop high-yielding, disease-resistant, and end-use quality wheat (*T. aestivum*, *T. durum* and *T. dicoccum*) varieties for India in general and peninsular zone in particular in collaboration with ICAR-AICRP wheat programme co-ordinated through IIWBR Karnal. ARI wheat breeding programme targeted for four agro-ecosystems viz., rainfed, irrigated full fertility, restricted irrigation, late sown for the development of wheat varieties in all the above three species. Production of breeder seed is done as entrusted by ICAR/Central or State Government. ARI is also engaged in disseminating the latest technology of wheat production directly on farmer's fields through field demonstration. The following progress and activities are underway through institutional support and collaborative projects with ICAR New Delhi, ICAR-IIWBR Karnal, CIMMYT Mexico and DBT New Delhi and DST Government of India.

Promising wheat entries in the pipeline and an advanced varietal trial (2021-22): Two MACS-ARI wheat entries, MACS 6768 and MACS 4100 (d) have reached final year testing at the national varietal identification programme. New entries MACS 4100 (d) and MACS 4106 (d), were identified as leaf, stem and yellow rust resistant, at AICRP wheat national trials.

Development, selection and advancement of breeding lines: For the development of breeding lines hybridization programme we generate 120-160 parental cross combinations and they will be screened for hybrid vigour and true F1 behaviour.

Disease survey, screening and evaluation: Based on 3 years yield and disease data for station trials, about 35 entries developed at ARI were promoted to the national programme on IPPSN 2021-22 (initial plant pathology screening nursery). A field scouting for disease surveillance in wheat growing areas of Pune and Satara districts was undertaken and 60 diseased samples were submitted for race analysis at Central Rust Laboratory in Flowerdale, Shimla. Plant pathological screening nursery evaluated 1747 genotypes through artificial epiphytotics using a mixture and prevalent race of leaf and stem rust of the region (11, 40A and 117-6 whereas brown rust races 77-5(121R63-1) and 104-2(21R55)).

Agronomy trial evaluation and findings: Under RIR trial the maximum mean yield (36.55 q/ha) was recorded for test entry MP1358 over checks. Nutrient management and sowing time trial recorded highest yield 52.69 q/ha, when sowing was done on 15th November as compared to other sowing dates. In the nitrogen optimization trial, the treatment having 100% recommended NPK at first node and boot leaf stage observed highest yield 43.87 q/ha compared to all other combinations. The experiment on lodging management in dicoccum wheat showed maximum wheat yield (43.46 q/ha) with Ethephon @ 30 ppm. In a new experiment for resource conservation technology the maximum wheat yield 38.08 q/ha was recorded under conventional

tillage-broad bed. The use of soybean residue either alone or in combination with wheat residue produced higher yield than control treatment.

Germplasm Characterization and Trait Discovery in Wheat using Genomics Approaches and its Integration for Improving Climate Resilience, Productivity and Nutritional quality: For the evaluation of wheat germplasm for drought stresses, a set of 3500 germplasms was evaluated during 2020-21. They were analyzed using a relationship matrix and only 500 unique core sets were advanced for robust phenotypic evaluation in the field as well as genetic analysis using genome wide association studies. The germplasm set of 4575 is planted for rust evaluation under artificial epiphytotic conditions.

Accelerating genetic gains in maize and wheat for improved livelihood: Planting was taken up for evaluation of 60 high potential wheat lines for local adaptation and yield traits.

Dissection of diversity and complex mechanism of *Bipolaris sorokiniana* infections in wheat using ToxA-Tsn1 interaction: The host-pathogen interactions during wheat and fungal pathogens *B. sorokiniana* are being evaluated.

Wheat breeder seed programme: Distribution of 162.5 q of breeder seed for the 2021-22 wheat cropping season to seed agencies (Mahabeej, NSC, KSSC), seed industries, farmers producers' organizations and farmers. The seed will reach an approximate of 1.5 to 2.0 lakh ha area in Peninsular India (Maharashtra and Karnataka). Nucleus seed and breeder seed production programme material was planted at Hol, Songaon farm and in farmers' fields.

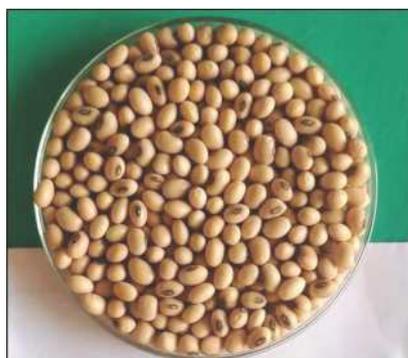
## Soybean Improvement

### Evaluation of MACS soybean varieties in All India Coordinated breeding trials

Soybean varieties developed at MACS-ARI, viz. MACS 1735 and MACS 1672 were tested in initial varietal trials for yield and overall performance across the 32 centres at all India level. These ranked 5th and 50th with a yield of 2766 kg/ha and 1996 kg/ha, respectively. Similarly, MACS 1724 an early maturing (93 days) soybean variety was tested in soybean early IVT trials ranked 11th with a yield of 2418 kg/ha in the year 2020.

For the development of varieties suitable for Maharashtra State, Agricultural Universities conducted State Multi-location trials at 12 different centers in the State. ARI contributed four MACS entries for the trials during kharif 2021.

### Notification and release of Kunitz Trypsin Inhibitor free (Null KTI) soybean variety MACSNRC 1667



**Figure 24**

Seeds of MACSNRC 1667

A soybean variety MACSNRC 1667 was notified and released by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties of Agricultural Crops for cultivation (Figure 24). This variety is suitable for cultivation in the Southern zone, which includes Maharashtra, Karnataka, Telangana, Andhra Pradesh and Tamil Nadu excluding rust prone areas on the banks of river Krishna like Southern Maharashtra, the entire area of Belagavi, Dharwad, Haveri Bidar and Bagalkot district. MACSNRC 1667 is Kunitz Trypsin Inhibitor

(KTI) free Essentially Derived Soybean Variety of MACS 450 and has been developed through marker assisted introgression of null allele of KTI from PI 542044 in MACS 450. It has recurrent parent genome content of 94% with null KTI allele derived from the donor PI 542044. It gave an average yield of 2051 kg/ha and is comparable to the yield of original variety MACS 450 (2080 kg/ha). It will be useful to soya based food and soya feed industries and for meeting the protein requirement in the diet.

### Evaluation of elite soybean entries developed under station trials

Seventy-nine elite breeding lines were developed and tested in four graded replicated trials. Of these, 7 lines gave significantly more yield than the highest yielding control varieties MACS 1188 and JS 335. Out of these, three lines MACS 1756, MACS 1745 and MACS 1779 gave seed yield of 2561, 2477 and 2486 kg/ha and were with 92, 90 and 85 days to maturity, respectively. Two entries MACS 1747 and MACS 1748 were identified as superior vegetable type entries with green pod yield of 4579 kg/ha and 4666 kg/ha, while dry seed yield was 2101 kg/ha and 2028 kg/ha. They show 100 seed weight of 18.60 g and 20.53 g with 85 and 88 days to reach R6 (full pod) stage respectively.

### Evaluation of the agronomic performance of soybean under All India Coordinated Agronomy trials

A novel bioformulation on soybean evaluated on soybean crop showed that the treatment containing bioformulation T7: 75 % RDF + Rhizobium + MDSR14 + 12c (2658 kg/ha) gave significantly higher seed yield of soybean over control (2052 kg/ha) and was closely followed by T6: 75 % RDF + Bio Zn + Bio NPK (2626 kg/ha). The treatment T7 and T6 recorded a higher number of root nodulation and its dry weight over the rest of the treatments. The treatment T7 recorded significantly maximum net returns per hectare (Rs. 65,518) and recorded benefit-cost ratio (2.66:1).

The partial factor productivity for soybean crop evaluated showed that the full package containing seed treatment, seed inoculation, RDF, weed management, insecticide treatment and sowing on ridges and furrow gave significantly higher seed yield (3040 kg/ha) of soybean over full package excluding RDF (2158) kg/ha and full package excluding weed management (2594 kg/ha). The differential yield was higher under the treatment where RDF (882 kg/ha) and weed management (446 kg/ha) was excluded from the full package of practices. Net returns (Rs. 77,286/ha) and benefit: cost ratio (2.81:1) was significantly high in treatment full package over the rest of the treatments.

### Frontline demonstrations and technology transfer

Fifteen frontline demonstrations were conducted on farmers' fields to evaluate the impact of improved production technology over the traditional farmers practice of soybean cultivation. Improved practice was



**Figure 25** Frontline demonstrations and farmer-scientist interaction

able to bring out 15 % increase in soybean yield over farmers practice, mostly due to the sowing of the improved soybean varieties MACS 1188, MACS 1281 and MACS 1460. An average yield under farmers practice was 25.67 q/ha while it was 29.60 q/ha with improved practice. With an additional cost of Rs. 2158/ ha, a net return of Rs. 13,379/ha can be obtained with the adoption of improved practice of soybean cultivation.

Twenty-five field demonstrations were conducted in collaboration with ITC, Nagpur. The improved practice comprising improved varieties viz. MACS 1188 and MACS 1281 gave an average 30 % yield increase over the farmer's traditional practice in Vidarbha region of Maharashtra. Farmers showed interest and willingness in soybean varieties developed by MACS-ARI (Figure 25).

### Consultancy and technical services rendered

A product testing consultancy for the evaluation of plant nutrition products of chickpea and maize was undertaken during rabi 2021 for a private firm.

### Soybean breeder and nucleus seed production

A total of 210 quintals of breeder seed of soybean varieties, including MACS 1188, MACS 1281 and JS 335 has been produced during kharif 2021 season. This seed will be supplied to public and private seed multiplying agencies and farmers as a source of pure seed in the year 2022. Similarly, a four acre summer soybean breeder seed production programme was undertaken, from which 40 quintals of breeder seed will be produced. Eleven quintals of nucleus seed of soybean varieties MACS 1188, MACS 1460, MACS 1281 and JS 335 has been produced which can be the source of seed for breeder seed production in kharif 2022 (Figure 26).



Figure 26 Soybean breeder seed production

### Soybean contract farming and collaborations for quality seed supply

Contract farming agreements were signed with four progressive farmers for the production of quality soybean breeder seed of recent varieties, to fulfill the breeder seed demand of the farmers producers organisation, seed multiplying agencies, KVK's etc. About 130 quintal soybean breeder seed of the varieties MACS 1188, MACS 1460, MACS 1407 and MACS 1520 was produced and procured from scientific guidance.

We entered into a collaboration with three farmers producers organisations for supply of quality soybean breeder seed for the next three years.

## Grape improvement

In the grape breeding programme, thirty-five cross combinations were attempted using twelve female parents and four seedless male parents viz. Jumbo, Manik chaman, Krishna seedless and Beauty seedless for

developing table purpose seedless varieties with good quality attributes. Total 1157 seeds derived from the crossing programme are being given the chilling treatment for obtaining good germination.

Excess rains during September and October caused stagnation of water in the field and caused heavy incidence of mildews and root rotting, which affected the plants.

### **Evaluation of grape juice varieties**

Six juice varieties were evaluated for berry yield, juice recovery and quality in a trial planted in randomized block design with 4 replications. In spite of heavy rains during the flowering followed by heavy disease incidence, ARI 516 (7.34 kg/vine) followed by Manjari Medika (4.62 kg/vine) performed significantly better than the control Bangalore blue (1.24 kg/vine) whereas significantly lowest yield was recorded in Arka shyam (1.16 kg/vine). ARI 516 recorded the highest bunches/ vine (56.71) whereas Gulabi x Bangalore purple recorded an average 10.17 bunches per plant. Bunch weight was highest in Manjari Medika (368.33 g) whereas lowest in Bangalore blue (77.38 g). Juice recovered in all the varieties was flavoured except Manjari Medika which has a neutral flavour. Sensory evaluation of juice was judged on its colour, flavour, consistency, mouth feel, taste and overall acceptance. The variety ARI 516 recorded the highest overall acceptability score followed by Manjari Medika.

### **Notification of grape variety ARI516**

The Central Sub-Committee on Crop Standards, Notification and Release of Varieties of Horticultural Crops (CVRC) has notified grape variety MACS 516 (ARI516) vide notification No. S.O. 1480(E) dated 01.04.2021 for cultivation in four states of India viz. Maharashtra, Punjab, Tamil Nadu and Telangana for processing purposes.

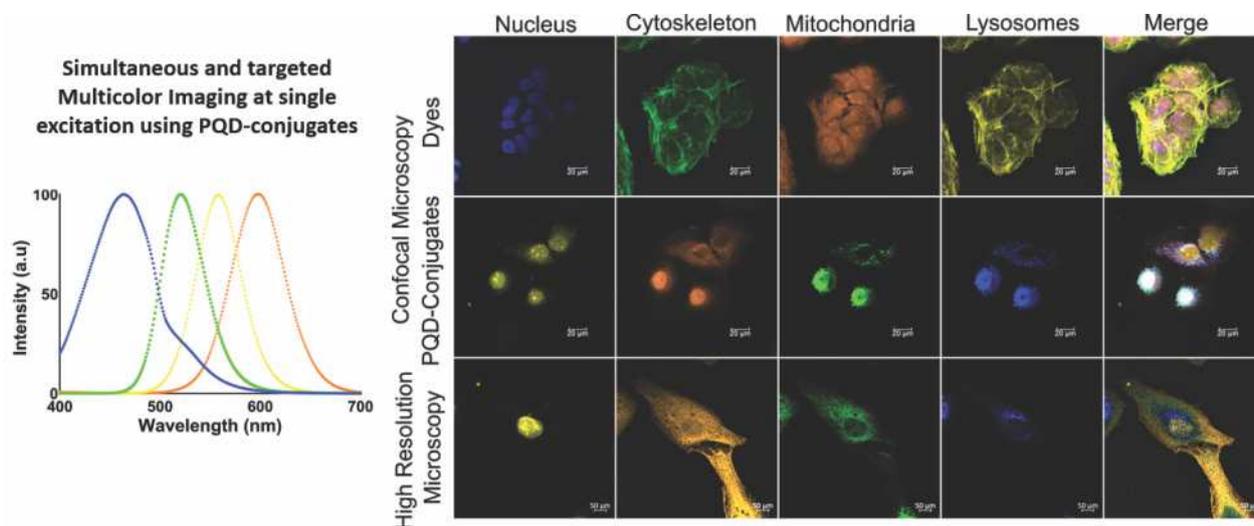
The variety is appreciated by farmers as well as consumers for lower cost of cultivations and unique musky flavour. The area under cultivation of this variety is increasing.

# Nanobioscience

The Nanobioscience group is engaged in research projects exploring the applications of nanotechnology in disease diagnostics, nanomedicine, nanomaterials/ nanoformulations for use in agriculture and basic studies on replication of Chikungunya virus.

## Quantum dots for bio-imaging applications

Quantum dots (QDs) are semiconductor nanocrystals with unique size-tunable emissions. To obtain a precise emission spectrum, monodispersity in size is imperative, which was achieved by controlling the reaction kinetics in a continuous flow of active microreactors. Further, a multivariate approach (dimensional analysis) was employed to impose stringent control on the reaction process resulting in monodispersed preparation of cadmium telluride (CdTe) quantum dots. Dimensional analysis was used to knit multiple variables into a dimensionless mathematical form which not only predicted parameters precisely to obtain narrow size tunability but also guaranteed reproducibility in synthesis. Analytical, structural, and optical characterization of the microreactor synthesized polydimethylsiloxane (PDMS) coated CdTe QDs revealed quantum efficient



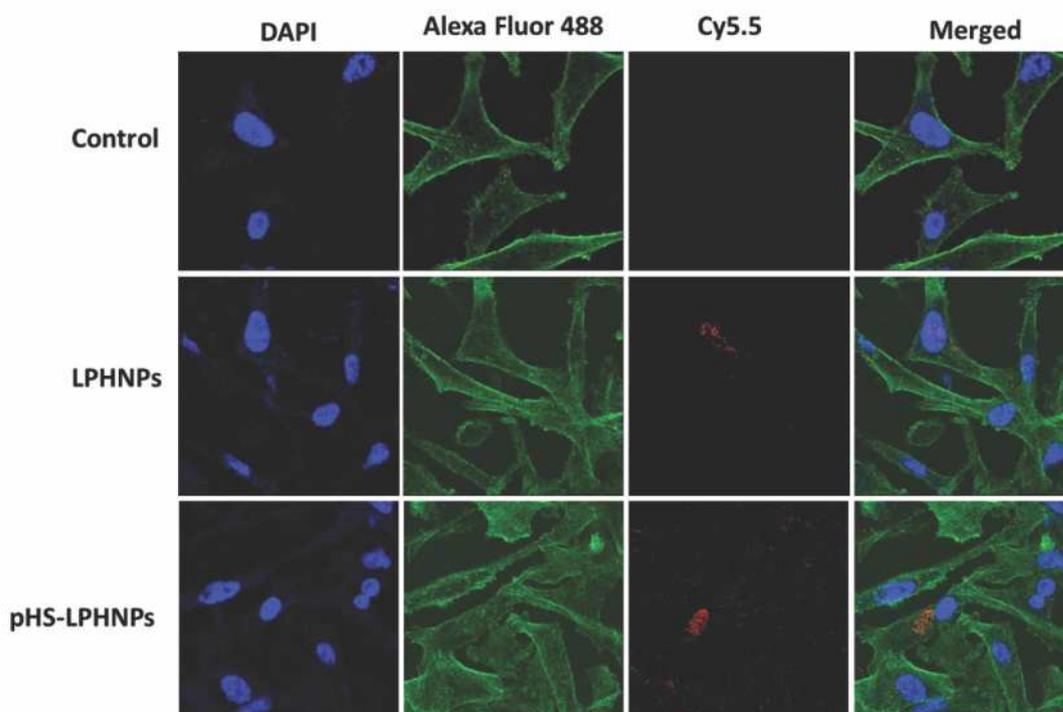
**Figure 27**

Photoluminescence spectrum of monodispersed and size-tuned QDs. Confocal microscopy images of HepG2 cellular organelles treated with commercial organelle-specific dyes (Hoechst-nucleus, Lyotracker Yellow-Lysosomes, Mitotracker Orange-Mitochondria, and Actin Green-Cytoskeleton) and PQDs (Yellow PQDs-Nucleus, Green PQDs-Mitochondria, Blue PQDs-Lysosomes, and Orange PQDs-Cytoskeleton). The bottom panel shows PQDs conjugates treated cellular organelles of HepG2 captured using the high-resolution Zeiss LSM 880 with Aery Scan microscope. Magnification 63 X-oil. Scale bar-20  $\mu\text{m}$  (Confocal microscopy) and 50  $\mu\text{m}$  (High resolution microscopy)

(61.5%), photostable (44%), and biocompatible nanocrystals of 5–15 nm. Further, PDMS-coated QDs (P-QDs) were conjugated with organelle-specific antibodies/ biomarkers for in-vitro imaging in NIH 3T3 cells. Likewise, proliferating cell nuclear antigen (PCNA) and anti-myosin (MF20) cardiomyocytes antibodies were conjugated with P-QDs (red and green, respectively) to image the cardiac tissue in zebrafish. Antibodies tagged with quantum dots were imaged simultaneously using confocal microscopy. Thus, multiplexed bio-imaging of cells in-vitro and zebrafish tissue was demonstrated successfully (Figure 27). The results indicate the suitability of continuous flow active microreactor in conjunction with the mathematical prediction of process parameters to synthesize reproducibly monodispersed and quantum efficient QDs.

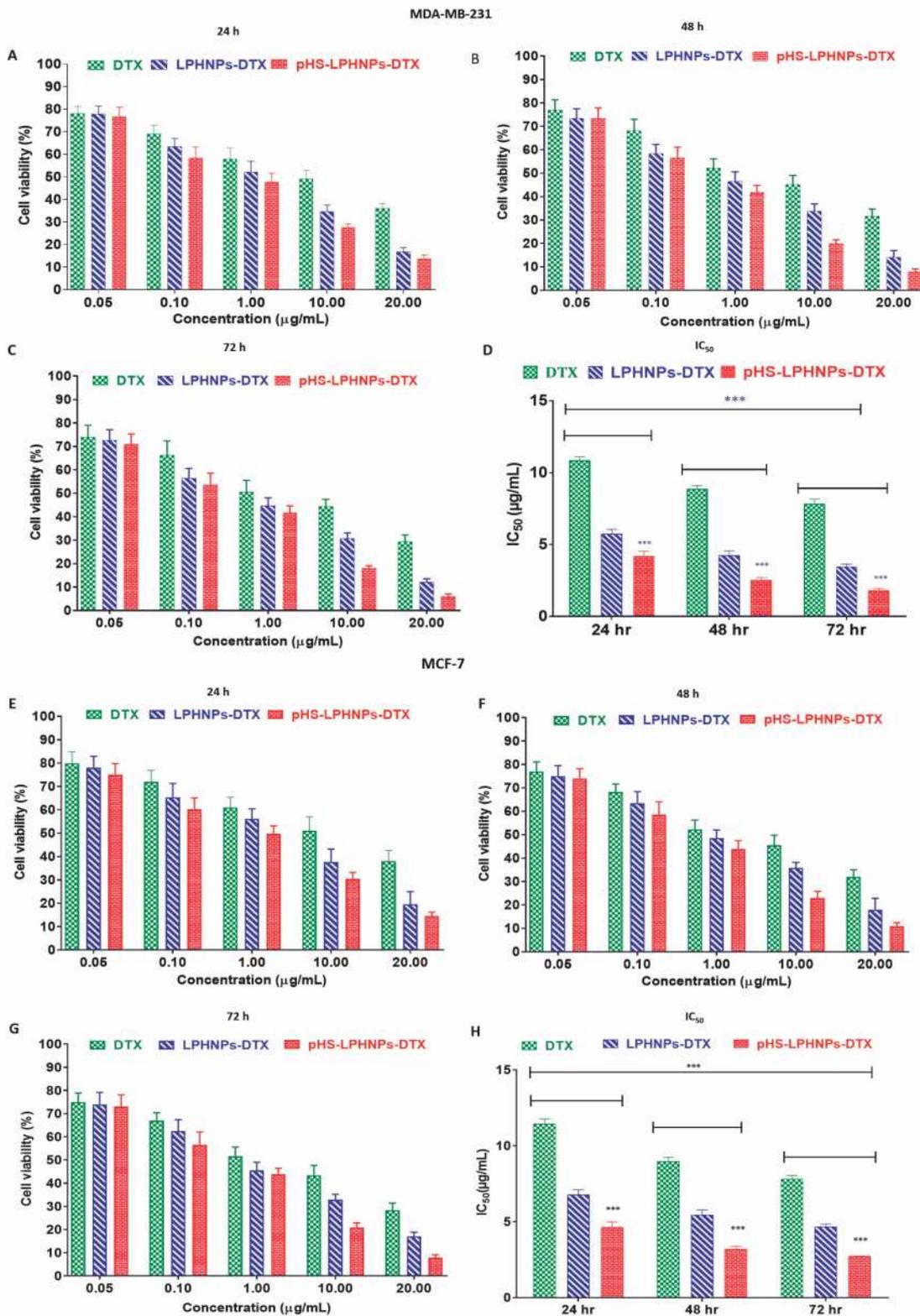
### Efficient in vitro and in vivo docetaxel delivery mediated by pH-sensitive LPHNPs for effective breast cancer therapy

This study was designed to develop pH-sensitive lipid polymer hybrid nanoparticles (pHS-LPHNPs) for specific cytosolic-delivery of docetaxel (DTX). The pHS-LPHNPs-DTX formulation was prepared by self-assembled nano-precipitation technique and characterized for zeta potential, particle size, entrapment efficiency, polydispersity index (PDI), and in vitro drug release (Figure 28). In vitro cytotoxicity of pHS-LPHNPs-DTX was assessed on breast cancer cells (MDA-MB-231 and MCF-7) and compared with DTX-loaded conventional LPHNPs and bare DTX. In vitro cellular uptake in MDA-MB-231 cell lines showed better uptake of pHS-LPHNPs. Further, a significant reduction in the IC<sub>50</sub> of pHS-LPHNPs-DTX against both breast cancer cells was observed. Flow cytometry results showed greater apoptosis in case of pHS-LPHNPs-DTX treated MDA-MB-231 cells (Figure 29). In essence, pHS-LPHNPs mediated delivery of DTX presents a viable platform for developing therapeutic-interventions against breast-cancer.



**Figure 28**

Confocal microscopy images showing internalization of LPHNPs and pHS-LPHNPs in MDA-MB-231 cell lines.

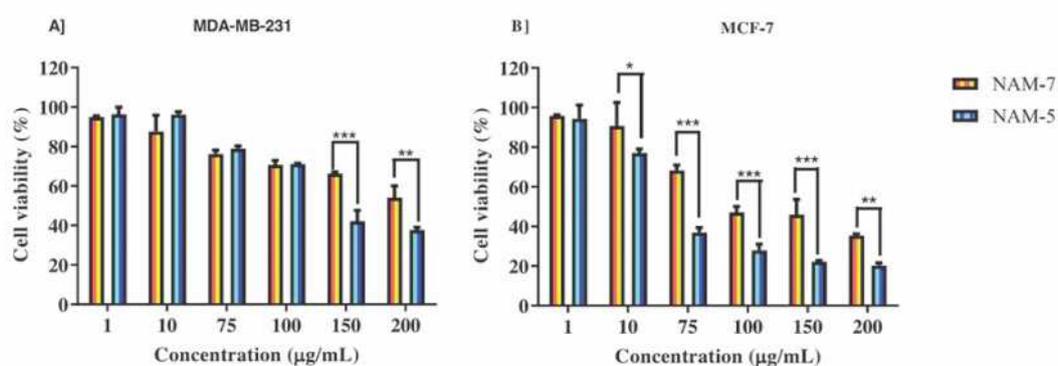


**Figure 29**

In vitro cytotoxicity assay in MDA-MB-231 cells at (A) 24 h, (B) 48 h and (C) 72 h. (D) IC<sub>50</sub> values of various formulations against MDA-MB-231 cells in 24, 48 and 72 h. In vitro cytotoxicity assay in MCF-7 cells at (A) 24 h, (B) 48 h and (C) 72 h. (D) IC<sub>50</sub> values of various formulations against MCF-7 cells in 24, 48 and 72 h. \*\*\*p < 0.001.

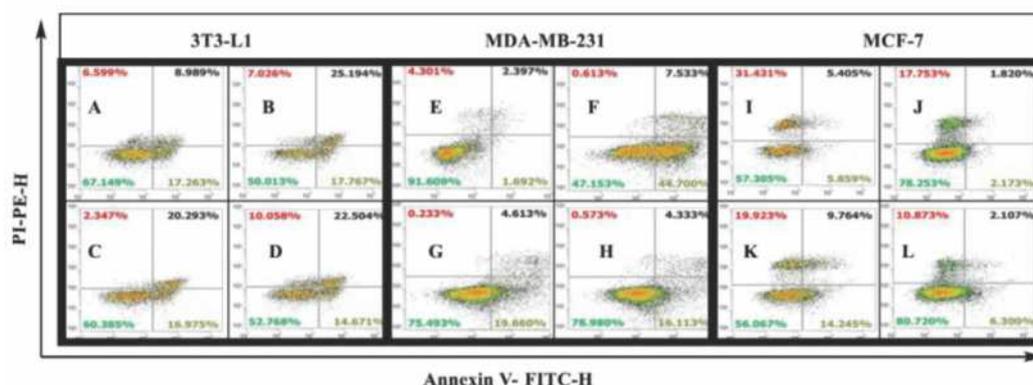
## Novel 3-fluoro-4-morpholinoaniline derivatives: Synthesis and assessment of anti-cancer activity in breast cancer cells

Heterocyclic morpholine compounds are well-known for their anti-cancer activity. In this study, novel morpholine and its sulfonamide derivatives were designed and synthesized as potential anti-tumor agents. The new compounds were obtained from amine derivatives via nucleophilic addition reactions, providing the desired products in 70 to 90% yield. Compounds NAM-5 and NAM-7 were tested for *in vitro* antitumor activity against breast cancer cell lines (MCF-7 and MDA-MB-231) (Figure 30). Amongst these, sulfonamide group-containing compound NAM-5 showed significant anti-proliferative activity with IC<sub>50</sub> of 1.811  $\mu$ M and 2.143  $\mu$ M for MCF-7 and MDA-MB-231 cells, respectively (Figure 31). On the other hand, NAM-7 showed good anti-proliferative activity against MCF-7 (IC<sub>50</sub> 1.883  $\mu$ M) but slightly lower activity against MDA-MB-231 cells (IC<sub>50</sub> 4.688  $\mu$ M). The cell death analysis by flow-cytometry confirmed apoptosis mediated cell death in MCF-7 and MDA-MB-231 cells when treated with the NAM-5 and NAM-7, respectively. The results demonstrated that the synthesized sulfonamide derivatives have significant potential as anti-cancer agents and have a substantial importance in cancer therapeutics with a favorable safety profile.



**Figure 30**

Cytotoxic effects of compounds NAM-5 and NAM-7 *in vitro*. Dose-dependent (1–200  $\mu$ g/mL) cytotoxicity of the NAM-5 and NAM-7 against (A) MDA-MB-231 and (B) MCF-7 cell lines for 24 h.



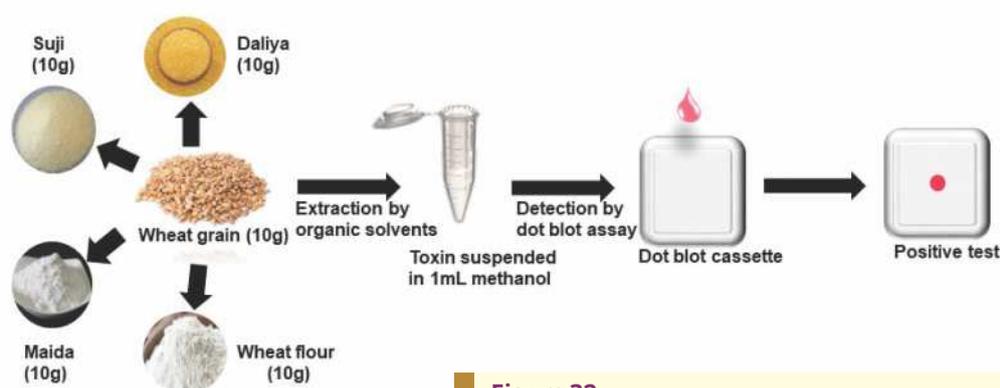
**Figure 31**

Flow cytometer analysis of 3T3-L1, MDA-MB-231 and MCF-7 cells treated with DOX (B, F and J), NAM-5 (C, G and K) and NAM-7 (D, H and L), respectively. Abbreviations: DOX, doxorubicin; FITC, fluorescein isothiocyanate; PI, propidium iodide.

### Rapid dot-blot assay for ochratoxin A (OTA) detection to ensure food safety

Ochratoxin A is a secondary metabolite produced by fungi and a major mycotoxin that contaminates cereal grains and cereal-based products. Although ochratoxin A is hepatotoxic, nephrotoxic and carcinogenic its detection is limited due to time-consuming conventional methods.

In this study, a rapid, user-friendly dot-blot assay was developed using peptide conjugated gold nanoparticles (AuNPs) as a detection agent. Bioinformatic tools were used to design a specific short peptide with suitable characteristics like solubility and high affinity. Indirect enzyme linked immunoabsorbent assay confirmed the low  $K_d$  value (1.046  $\mu\text{M}$ ) suggesting high binding of peptide with ochratoxin A. The peptide was conjugated to gold nanoparticles with streptavidin – biotin interaction and a dot-blot assay was developed for detection of ochratoxin A with a limit of detection of 0.49  $\mu\text{g}/\text{kg}$  (Figure 32). Further, detection of ochratoxin A from spiked wheat samples was comparable by dot-blot and conventional HPLC method. Validation of ochratoxin A by dot-blot was performed using HPLC in 65 wheat samples with a high correlation with  $R^2 = 0.93$ . HPLC and dot-blot confirmed the presence of ochratoxin A 5  $\mu\text{g}/\text{kg}$  in the samples. Therefore, a portable, easy-to-use dot-blot assay for ochratoxin A detection with potential of application at each stage of harvesting, storage, production and distribution can contribute to safe and healthy food and feed.



**Figure 32**

Rapid dot-blot assay for ochratoxin A (OTA) detection to ensure food safety

### Oil nanoformulation for mealybug pest control

The sap sucking insect pest, pink mealybug or *Maconelicoccus hirsutus* damages crops like cotton, sugarcane, soybean, maize by causing plant stunting, yellowing, defoliation and wilting. The pest causes secondary damage due to secretion of a sugary sap, promoting sooty mold growth that hampers plant photosynthesis and reduces crop yield. Mealybug control by chemical application is difficult due to its waxy protective covering.

A green strategy was devised for control of *M. hirsutus* by utilizing insecticidal oils like garlic and citronella. The active ingredients of these oils are volatile in nature and highly labile, thus reducing their field efficiency. The nanotechnology approach was utilized by encapsulation of essential oils into polymeric nanoparticles for the gradual, sustained release and improved activity of the active ingredient (Figure 33). Polymeric NPs encapsulating the essential oils were synthesized by ionic gelation method having ~130-140 nm size and with charge of +23-25 mV.

*M. hirsutus* insect bioassay showed high mortalities due to rapid destruction of protective woolly layer of pest (1 h). Spraying of oil nanoformulation on mealybug infested plants showed insect mortality (> 80 %) as compared to imidocloprid chemical control. Essential oil nanoformulations can be used as biopesticide for pest control for sustainable agriculture. This technology has been transferred to SKR Agrochemicals, Wardha.

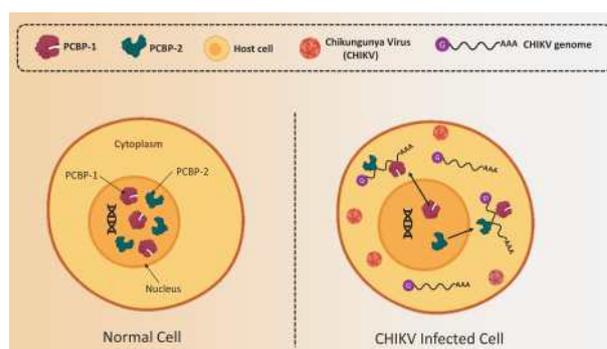


**Figure 33**

Oil nanoformulation for mealy bug pest control

### Elucidating the role of Poly(C)- Binding Protein 1 and 2 (PCBP1 and PCBP2) host factors in Chikungunya virus replication

Chikungunya virus (CHIKV) has become an emerging threat to global public health. Despite extensive research, the molecular biology and pathogenesis of CHIKV are poorly understood. There is no approved therapeutic antiviral or vaccine available against CHIKV. Identifying critical host factors required for CHIKV replication can give significant insights into virus replication and pathogenesis. In our study, the role of Poly(C)- Binding Protein 1 and 2 (PCBP1 and PCBP2) host factors in CHIKV replication was studied. RNA immunoprecipitation study indicated that PCBP1 and PCBP2 interact directly with the CHIKV RNA. Predominantly nucleus localizing PCBP1 and PCBP2 proteins are re-localized to the cytoplasm at the site of CHIKV replication, as evidenced by the immunofluorescence study. However, endogenous levels of PCBP1 and PCBP2 are unaltered in CHIKV replicating cells (Figure 34). siRNA-mediated knock-down of PCBP1 and PCBP2 significantly inhibited CHIKV replication, indicating these factors are essential CHIKV replication. The present study highlights the importance of human host factors, PCBP1, and PCBP2, in the CHIKV life cycle.



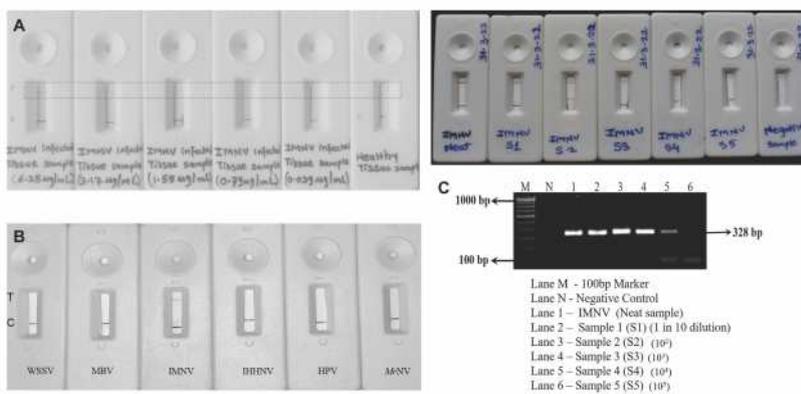
**Figure 34**

Schematic representation showing roles of PCBP1 and PCBP2 in Chikungunya virus replication. siRNA mediated knock-down of PCBP1 and PCBP2 significantly inhibited CHIKV replication, indicating their crucial requirement for CHIKV replication. The levels of PCBP1 and PCBP2 remain unchanged after CHIKV infection; however, there were significant changes in subcellular localization patterns of PCBP1 and PCBP2. PCBP1 and PCBP2 directly interact with the CHIKV genome. PCBP1 and PCBP2 might play a significant role in forming the viral replication complex

## A lateral flow diagnostic detects infectious myonecrosis virus, the aquaculture pathogen

Infectious myonecrosis virus (IMNV, member of the family *Totiviridae*) is the causal agent of infectious myonecrosis (IMN) in shrimps. Shrimp and prawn are considered superfoods because of high protein content, which also makes them an important export commodity. Infections due to IMNV cause significant (up to 70 %) mortality in pond-reared populations of whiteleg shrimp (*Penaeus vannamei*) and giant tiger prawn (*Penaeus monodon*). Juveniles and sub-adults are the stages which are affected. The infection is characterized by whitish muscles along the abdomen and tail region. OIE has identified IMNV as one of the major viral pathogens of crustaceans and hence active surveillance is initiated. Good farm management practices along with suitable diagnostics that can detect viruses and avert the economic losses to the aquaculture industry is the current need.

We describe the development and optimization of an antibody-based lateral flow assay (LFA) for detection of IMNV in the post-larvae (PL) of the white leg shrimp (*Penaeus vannamei*). In the assay, polyclonal antibodies against the IMNV coat protein were used as the biorecognition element and gold nanoparticles were used to visualize the result. Under optimized conditions, IMNV could be detected within 20 min with high specificity, reproducibility, and sensitivity (LOD =  $10^4$  viral particles). LFA results were validated with the qRT-PCR test which is the 'gold standard'. For validation, infected PL samples (n = 60) collected from the hatcheries and nurseries were used and a high sensitivity (100%) and specificity (86%), with a Cohen's kappa coefficient of 0.86, suggested 'good agreement' between the developed LFA and qRT-PCR. Thus, the LFA has the advantages of field usability, minimum sample preparation and can be deployed on-field (Figure 35). It can be used as a 'self-test' not only by the farmers engaged in aquaculture for ensuring 'no infection' in the PL stage of *Penaeus vannamei*, but also for disease surveillance.



**Figure 35**

Development and validation of LFA for detection of IMNV. (A) Limit-of-detection using infected post-larvae tissue samples (B) No cross-reactivity with other shrimp viruses (C) Limit-of-detection in comparison to 'gold standard' qRT-PCR method. Minimum  $10^4$  viral particles are detected in LFA.

# Annexure

## Repositories

### Agharkar Herbarium at MACS (AHMA)

During the reporting period 2000 new specimens were added to the AHMA collection which includes 500 specimens of the genus *Capparis*. AHMA now represents the biggest and widest collection of *Eriocaulon*, *Ischaemum* and *Capparis* species. AHMA also holds a rich collection of medicinally important plants. One Epitype of *Capparis zeylanica* and an Isotype of *Vicoa sahyadrica* were also added to AHMA. The present number of species in AHMA now is 34000. Twelve researchers from different parts of India visited and consulted AHMA. Currently our diatom collection holds around 3700 samples covering the present day to Pleistocene period. The present culture collection holds 12 strains of *Gomphonema* and 20 strains of *Stauronies*.

### Ajrekar Mycological Herbarium (AMH)

Ajrekar Mycological Herbarium holds 10458 exsiccate specimens including 117 specimens received from different centers in India for deposit and accession during the period of report.

### Animal Facility

Animal Facility at ARI 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 Facility has well organized infrastructure. This year we a) conducted routine genetic and biochemical monitoring of laboratory animals using microsatellite SSLP and biochemical markers b) conducted two Institute Animal Ethics Committee (IAEC) meetings and IAEC has provided approval for total 27 proposals c) upgraded the facility by developing preclinical pharmacological and toxicological laboratories d) performed 10 proposals on contract basis and 08 intra and extramural projects e) published 04 international articles based on the animal work conducted in the facility f) provided quality and healthy animals by ensuring the persuasion of 4Rs (Replace, Reduce, Refine, Rehabilitate) g) provided training for technical staff, students and scientists of different groups of the Institute and also to students of outside the Institute in ethical handling of laboratory animals h) generated revenue for the Institute by selling of the animals and performing projects on the contract basis i) developed animal models of various diseases to test various drugs and biologically active molecules.

### Crude Drug Repository

The ARI Crude drug repository hosts 2,019 specimens (1988 plant originated (1955 organized and 33 unorganized), 19 animal originated, 12 mineral originated) of plant parts used as/in medicine collected from field and or market.

## 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. Revision taxonomic status of certain specimens considered as trace fossils from the Paleogene of Kachchh and deposited as type specimens, completed while.

## MACS Collection of Microorganisms (MCM)

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

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

As a part of the conservation of fungal diversity, live, pure and authenticated cultures of interesting fungi received from various organizations in India were deposited and accessioned. The total accession of NFCCI comes to 5221. 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 212 fungi were accessioned and 25 authentic fungal strains were supplied to various academia, research institutions and industries.

## Library and Information Centre

The Library and Information Centre is the hub of learning and research activities. It has played an essential role in providing information and various services to its users. The Library is enriched with a valuable archive of the Founder-Director Prof. S. P. Agharkar. This archive includes book collections, rare back volumes, periodicals, and reference works primarily in German. ARI library has print, online journals, and databases accessible within the campus through campus LAN. It is also a part of a CSIR- DST consortium known as the National Knowledge Resource Consortium (NKRC). The Library has acquired "Grammarly," a software that aids writing skills during the past year. The Library has migrated totally to KOHA- open-source software. SMART- DMS is an active repository of various information related to the institute, including research papers, patents, monographs, Ph.D. thesis, etc., which are uploaded regularly. Hindi books are purchased to promote the Hindi language. Email intimation about the new arrival of information resources is given to the users. The Library and Information Centre maintains the institute's website and social media sites (Facebook, Twitter, and Instagram).

The current holdings of the Library are:

Particulars	Total	Particulars	Total
Books / Bound Volumes	29894	Maps and Atlases	569
Reference Books	1137	Microfilms / Fisches	636
PhD Thesis	381	Annual Report	10
M Sc / M Phil Thesis	97	Journals	51
ARI Reprints	3682	Digital collection/Documents	3210

## Services Rendered/Offered

### Crude Drug Authentication Service

ARI has been rendering the authentication service of identification/ authentication of crude drug samples/ specimens for academic as well as industrial purposes. A total of 121 authentication reports were generated. Ten samples were processed as a part of contract research.

### Fungal Identification Service of NFCCI

During the period of report 271 fungal cultures, other samples received from academic, research institutions and industry were authenticated / identified. As such, 140 centers including academic and research institutions and private centers in India benefited from various services of NFCCI.

### Diatom identification service

ARI has been rendering the diatom based river health assessment for Worldwide Fund for Nature. A total of ten samples were generated.

### Technical services

In this pandemic situation, products like air ionizer, sanitization chamber, document and currency sanitizer, nanoparticle coated face masks, disinfectants, etc. were developed by Indian companies. ICMR had recognized ARI for checking the efficacy of these products. Testing was done of coated adhesive antimicrobial film, protect C sample, microbial analysis of swab. Forty-three samples were identified for bacteria based on 16S rRNA gene sequencing. Six samples were tested for biomethane potential analysis of biomass like pressmud, soybean plant waste organic fraction of MSW for some industries. Analysis for biogas, soil toxicity, total viable count, and soil microbial biomass was done. Product testing for a private firm was done to evaluate the absorption of phosphorus and potash by chickpea and maize crop after the application of potassium salt of active phosphorus.

### Patent granted

Immunoassay, peptide-based agent and field-usable kit for early rapid detection of white spot syndrome virus. No. 393879, 31.3.2022

Bacteriophage based microfluidic assay for bacterial detection. No. 380658, 28.10.2021

### Patent applied

Nucleic acid-based test kit to detect viral RNA, DNA, other biomolecules and an assay thereof. No. 202121027919, 22.6.2022, TEMP/E-1/31284/2021-MUM

### Memorandum of Understanding

MoUs were signed with 1) M/s Insignia Communication Company, Mumbai, for training trainees from Nepal, Sri Lanka and Bangladesh in microbiology education program, and 2) ICAR-National Institute of Abiotic Stress Management, Malegaon, Baramati, Pune for mutual interests in the fields of research, development, education, training, transfer of technology and dissemination of knowledge.

## Publications (Book Chapters/ Book Reviews/ Bulletins/ Research Papers / Monographs/ Booklets)

### Book Chapters

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## Book Review

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## Participation in Conferences/ Symposia/ Seminars/ Workshops/ Meetings

### Biodiversity - Plants and Diatoms

Choudhary RK Research Advisory Committee meeting, Naoroji Godrej Centre for Plant Research, Shirval, 22 February 2022; 7 March 2022. Annual progress review online meeting, OEB-Plant Science, SERB, 22 March 2022

Datar MN DST- Vigyan Samachar online meeting, 18 May 2021. Pune Knowledge Cluster meeting, Pune, 18 August 2021; 5 January 2022. Board of studies (Botany) meeting, Abasaheb Garware College, Pune, 12 March 2022; Modern College, Pune, 23 March 2022

Karthick B DBT Northeast Project online meeting, 31 May 2021. National Education Policy 2020 programme, 29 July 2021. DST online Training Programme on Water Resources Management & Sustainable Habitat for Scientists & Technologists, Indian Institute of Public Management, 8-12 November 2021. DST Training Programme on Financial Management in Scientific Organizations, Indian Institute of Public Administration, New Delhi, 17-21 January 2022. Research Advisory Committee meeting, Karnataka Forest Department, Bangalore, 23 March 2022. 26<sup>th</sup> International Diatom Symposium, 23-25 August 2021

Thacker M, Wadmare N Diatoms of Myristica swamps from the Western Ghats, India. 26<sup>th</sup> International Diatom Symposium, 23-25 August 2021

### Biodiversity - Fungi and Lichens

Rana S & Singh SK Poster presentation, International e-Conference, ICAR-IARI, New Delhi, 18-20 August 2021. Best Poster Presentation Award

Avchar R & Baghela A Poster presentation, 15<sup>th</sup> International Congress on Yeasts and 30<sup>th</sup> International Conference on Yeast Genetics and Molecular Biology, 23-27 August 2022

Snigdha T & Baghela A Poster presentation, 15<sup>th</sup> International Congress on Yeasts and 30<sup>th</sup> International Conference on Yeast Genetics and Molecular Biology, 23-27 August 2022

Jadhav R, Vijay A & Baghela A Oral presentation, 15<sup>th</sup> International Congress on Yeasts and 30<sup>th</sup> International Conference on Yeast Genetics and Molecular Biology, 23-27 August 2022

Behera BC, Sutar R SERB Accelerate Vigyan online Workshop, CSIR-National Botanical Research Institute, Lucknow, 5-7 July 2021

Gaikwad S, Sutar R International Workshop cum online Conference, Kumaun University, Nainital, 29-30 July 2021.

Sutar R Online Workshop, CSIR-National Botanical Research Institute, Lucknow, 5-7 July 2021

### **Bioenergy**

Pore S, Gaikwad S Virtual Conference, CRISPR/Cas iCRISPR-2021, 25-27 November 2021

Gaikwad S Poster presentation, Joint Academic Microbiology Seminars, 23-24 August 2021

Yadav K Poster presentation, Online Life and Space Conference of Polish Astrobiology Society, 29 September-1 October 2021

### **Bioprospecting**

Srivastava P Virtual Conference, Global Summit on Drug Delivery, Discovery, and Pharmaceutical Formulation, 23 September 2021

### **Developmental Biology**

Ratnaparkhi A Virtual symposium, Phase separated systems in the nucleus, 6-9 April 2021. Co-Chair, Poster session, Indian Drosophila Research virtual Conference, 13-17 December 2021. India-EMBO lecture virtual course, NCCS, Pune, 7-11 February 2022

Shravage BV IUBS Centenary Webinar, 27 April 2021. ERATO International Symposium on Intracellular Degradation, University of Tokyo, 17 June 2021. Indian Drosophila Research virtual Conference, 13-17 December 2021

Nilangekar K, Ayachit M India Investigator Network Webinar Series 2022.

Jyotish S Poster presentation, India-EMBO course RNA binding proteins, 7-11 February 2022, NCCS, Pune.

Basargekar A Poster presentation, Indian Drosophila Research virtual Conference, 13-17 December 2021.

### **Genetics and Plant Breeding**

Jaybhay SA National Seminar, Advances in Sustainable Management of Natural Resources for Food and Nutritional Security, Navsari Agricultural University, Navsari, 26-27 August 2021

Phalake SV International virtual Conference on Tropical Fruits, Malaysia, 28-30 September 2022

## **Invited Talks**

### **Biodiversity - Plants and Diatoms**

Choudhary RK Online - Kongunadu Arts and Science College, Coimbatore, 27 July 2021. Savitribai Phule Pune University, 25 November 2021. Thai Nguyen University, Vietnam. Central University of Jammu, 6 January 2022. Goa University, Goa, 4 February 2022. Workshop - Shivaji University, Kolhapur, 21 February 2022. Nowrosjee Wadia College, Pune, 8 March 2022.

Datar MN Bombay Natural History Society, 14 July 2021. Webinar, Khalsa College, Mumbai, 13 August 2021. Webinar, KTHM College, Nashik, 24 August 2021. Jividha, Pune, 10 October 2021. GGIM and SPPU, 11 February 2022. Workshop, Nowrosjee Wadia College, Pune, 8 March 2022.

Karthick B Online demonstration, Skill Development Programme, Biodiversity: Concept to Conservation, Madurai Kamaraj University, Madurai, 26 March 2021. Online lectures: Pune Knowledge Cluster and Agharkar Research Institute, 15-30 April 2021. Coordinator, Online course, Entrepreneurial Skills Development Course for Young Researchers, 11-29 Oct 2021. Ashoka University, 8 October 2021. Refresher programme in Botany, Savitribai Phule Pune University and Department of Higher Education, Government of Odisha, 27 November 2021. National Centre for Biological Sciences, 27 November 2021. Savitribai Phule Pune University, Pune. 14-15 February 2022. Indian Institute of Science Education and Research, Mohali, 23 and 28 February 2022. Webinar, Trends in Algal Research, Fergusson College, Pune, 10 March 2022.

### **Biodiversity - Fungi and Lichens**

Singh SK Guest lecture, National Webinar, College of Agriculture, Rajendranagar, Hyderabad, 24-25 September 2021. Talk, National Conference, ICAR-IARI, New Delhi, 18-20 August 2021.

### **Bioenergy**

Dagar SS, Rahalkar M, Lanjekar VB, Pore S Talk, 12<sup>th</sup> Special Training, ICFRE 2022, NFCCI, ARI, Pune

Dhakephalkar PK Coordinator, Online course, Entrepreneurial Skills Development Course for Young Researchers, 11-29 Oct 2021

### **Developmental Biology**

Ratnaparkhi A Lectures, IISER, Pune, 2-3 March.

Patra C Lectures - Poona College of Pharmacy, Pune 2022. SPPU, Pune, 2021, 2022. IABMS Conference, NIITE University, Mangalore 2021. Sister Nivedita University, Kolkata, 2021.

Shravage BV Lecture, SPPU, Pune. Talk, TASC for Stem Cell and Regenerative Medicine, DBT, 14 September 2021.

### **Genetics and Plant Breeding**

Jaybhay SA Talk, Virtual training, Department of Agriculture, Government of Maharashtra. 21 May 2021, 22 February 2022.

Idhol BB Talk, Department of Agriculture, Government of Maharashtra, Baramati, 21 July 2021.

Tetali S Talk, SPPU, Pune, 6 December 2021.

Baviskar V Online talk, Wheat, 15 January 2022.

Navathe S Online talk. Wheat, 15 January 2022.

Yashavanthakumar KJ, Navathe S, Baviskar V Azadi ka Amrut Mahotsav Talk, Agharkar Research Institute, Pune, 24 February 2022.

### **Nanobioscience**

Ghormade V Talk, KTHM College, Nashik, 3 August 2021. National online Conference, Mycology and mankind: Marching ahead in the new era, 10 March 2022. Webinar, NutriFood-2022 Congress USA, 28 March 2022.

Karpe YA Talk, Tatyasaheb Kore College of Pharmacy, Warananagar, Kolhapur, 17 December 2021. TC College, Baramati, 11 February 2022

Rajwade JM Abeda Inamdar Sr. College of Arts, Commerce and Science, Pune, 6 October 2021. AISSMS College, Pune, 5 October 2021. Tatyasaheb Kore College of Pharmacy, Warananagar, Kolhapur, 15 December 2021.

## Honours/ Awards/ Distinctions

Kaushik T et al. Best paper award, Molecular and morphological taxonomy of living Ammonia and related taxa (Foraminifera) and their biogeography, 2021, *Micropalaeontology*, 67(2-3)

Singh PN Second Prize. Photography competition on "Mesmerizing Fungi", Ratnam College of Arts, Science & Commerce, Bhandup, Mumbai & Mycological Society of India, Mumbai Unit, World Fungus Day, 2 October 2021

Singh SK Elected as Fellow, Maharashtra Academy of Sciences (Life Sciences)

Yashavantha Kumar KJ and Navathe S Members, International Expert Working Group, [www.wheatinitiative.org](http://www.wheatinitiative.org)

## National Awards

The following PhD scholars brought accolades to the institute.

### National Bio Entrepreneurship Competition (NBEC) 2021

Snehal Jamalpure. Winner. Snehal and her team mentored by Dr Kishore Paknikar and Dr Jyutika Rajwade devised 'Matsya Suraksha', a technique for identifying viral diseases affecting the aquaculture industry.

### DST AWSAR Award 2021

Lagashetti A. First prize. Popular story writing competition in Hindi

Suryavanshi K, Vikhe P, Venkatesan S, Yadav K. Winners. Best science story based on PhD topic

## PhD degree award

Student, Subject	Thesis	Guide, Co-Guide
Basargekar Anagha Zoology	Investigation of the role of DMon1 in Drosophila nervous system	Ratnaparkhi A
Patil Gokul Biotechnology	Development of chitosan based hydrogels for rapid hemostasis	Ghormade V
Patil Rajashree Biotechnology	Roles of microRNAs in Hepatitis e virus replication	Karpe YA
Pingale Kunal Biotechnology	Interaction of hepatitis E virus RNA dependant RNA polymerase with host cell proteins	Karpe YA
Nagkirti PD Biotechnology	A microbial process for decontamination of saturated and aromatic hydrocarbons associated with terrestrial oil spills	Dhakephalkar PK
Pore Soham Microbiology	Biomethanation of rice straw at elevated temperature: Assessment of microbial community dynamics	Dhakephalkar PK, Dagar SS
Turwankar Anuprita Biotechnology	Role of VEGF and FGF signaling in regeneration and pattern formation in hydra	Ghaskadbi SM, Patra C
Varma Mokshada Biotechnology	Thiosemicarbazone derivatives as modulators of A $\beta$ induced oxidative stress and toxicity in Alzheimer's disease	Kulkarni P
Mehta Nikita Biotechnology	Deciphering the molecular mechanisms underlying the genetic diversity in the plant pathogenic fungus <i>Colletotrichum gloeosporioides</i>	Baghela A

## Supervision of PhD Students

(Guide, Co-Guide, Student, Thesis)

### Biodiversity - Plants and Diatoms

#### Choudhary RK

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

Vigneshwaran A. Diatom diversity across the streams and rivers of the Western Ghats and its application in water quality monitoring

#### 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

#### Karthick B

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

Wadmare Neha. Systematics and Biogeography of the genus *Stauroneis* Ehrenberg (Bacillariophyceae) from the Indian Subcontinent

Cheran Radhakrishnan. Aerophilic diatoms of Eastern Himalayas: diversity and distribution across environmental gradients

### Biodiversity - Fungi and Lichens

#### Baghela A

Avchar R. Exploration of diversity, taxonomy, phylogeny and biotechnological potential of thermotolerant and thermophilic yeasts from diverse habitats

Mehta N. Deciphering the molecular mechanisms underlying the genetic diversity in the plant pathogenic fungus *Colletotrichum gloeosporioides*

#### Behera BC

Tiwari S. Diversity, taxonomy, phylogeny and biotechnological potential of yeasts associated with wood feeding termites of the Western Ghats

Dambare S. Multiplexed detection of bacterial pathogens using LAMP in a single microfluidic chip

Gaikwad S. Studies on selected macro-lichens and their bioactive constituents for its use as pharmaceutical supplements

Sutar R. Studies on antimicrobial, antioxidative, cardiovascular-protective and cytoprotective potential of selected macrolichens and their secondary compounds

#### Rajeshkumar KC

Ashtekar N. Studies on taxonomic complexities of Indian *Penicillium* species following polyphasic taxonomic concept

**Singh PN**

Pawar K. Studies on Alkaliphilic Fungi for Alkaline Protease Production and its Applications

**Singh SK**

Lagashetti A. Studies on fungal pigments and their application in dyeing textile fabrics

Rana S. Studies on Fusarium spp. for Beauvericin Production and its applications

**Biodiversity - Palaeobiology****Kulkarni KG**

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

Soman AC. Studies in Paleogene bivalvia from Kachchh with special reference to palaeozoogeographic considerations (as Co-guide)

**Bioenergy****Dhakephalkar PK**

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

Deshpande P. Enhanced biomethanation of untreated rice straw using anaerobic fibrolytic fungi

Yadav K. Studies on methanogens at extreme eco physiological conditions: Implications for life on Mars

**Rahalkar MC**

Khatri K. Exploration of diverse methanotrophs for taxonomic novelty and biotechnological potential

Mohite J. Utilizing the potential of methane-oxidizing bacteria for methane mitigation and valorization

**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

Hivarkar S. Investigating diversity of thermophilic anaerobic bacteria from hot spring environments for utilization of agricultural biomass

**Bioprospecting****Kulkarni PP**

Suryavanshi KR. Understanding the role of metal ions in neurodegeneration and inflammation in Alzheimer's disease

Shete PA. Studies on inflammation associated with iron dyshomeostasis and its prevention

**Srivastava PS**

Gulawani SS. A study of mechanism of action of natural products based molecules in gynecological cancers

**Developmental Biology****Ratnaparkhi A**

Wagh G. Elucidation of the role of selected secreted molecules in zebrafish development

**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

**Shravage BV**

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

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

Selarka K. Autophagy regulators in the female germline stem cell (GSC)-niche

Kulkarni M. Mitophagy regulators in the female germline stem cells in *Drosophila*

Ayachit M. Role of Atg1 in mitochondrial dynamics during *Drosophila* development

**Genetics and Plant Breeding****Tamhankar SA**

Chavan AM. Study of the diverse semi-dwarfing genes in durum wheat

**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

**Patil RM**

Mundhe S. Agronomic, physiological and transcriptomic response of soybean to drought stress at reproductive stage

Vikhe P. Genetic studies on gibberellin-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

**Tetali SP**

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

Idhol BD. Genetic Diversity, Stability, Heterosis and Combining ability studies in Vegetable Soybean (*Glycine max* (L.) Merrill)

Phalake SV. Evaluation of promising ARI grape hybrids and varieties for end-use and standardization of cultivation practices for hybrid ARI 516

**Nanobioscience****Rajwade JM**

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

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

Jamalpure S. Development of multiplexed, point of care (POC) diagnostics for detection of viral pathogens affecting Shrimp and Prawns

Madiwal V. Nanoscale surface modification of dental material for preventing implant related failures

#### **Bodas DS**

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

#### **Ghormade V**

Rahi S. Rapid detection of mycotoxins for ensuring food safety

#### **Gajbhiye V**

Salwe R. Targeted co-delivery of siRNA for effective therapeutic outcome against metastatic ovarian cancer

#### **Karpe YA**

Salunke P. Exploring non-pathogenic protozoa as a eukaryotic platform for protein expression

#### **Jadhav SH**

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

## **राजभाषा**

संस्थान में राजभाषा अनुभाग, विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार द्वारा समय-समय पर जारी विभिन्न आदेशों/निर्देशों का अनुपालन सुनिश्चित करने के लिए निरंतर प्रयास किए जाते हैं।

भारत सरकार से प्राप्त निर्देशों के अनुपालन हेतु हिंदी अनुपालन समिति का पुनर्गठन किया है।

अभियांत्रिकी अनुभाग और पुस्तकालय एवं सूचना केंद्र को अपना समस्त कार्य हिंदी में करने के लिए निर्देश दिये गये हैं।

राजभाषा नियम 1976 के नियम 8(4) के अनुसार प्रवीणता प्राप्त अधिकारियों/ कर्मचारियों द्वारा संपूर्ण कार्य हिंदी में करने हेतु पत्र भेजे गये और प्रत्येक तिमाही के दौरान हिंदी में किये कार्य का ब्यौरा प्रस्तुत करने के निर्देश दिये गये हैं।

राजभाषा अधिनियम 1963 (यथा संशोधित 1967) की धारा 3(3) के अंतर्गत आवश्यक सभी दस्तावेजों/ कागजातों को अनिवार्यता से द्विभाषी (हिंदी-अंग्रेजी) किया जाता है।

संस्थान में उपयोग में लाये जानेवाले सभी फॉर्मस् द्विभाषी हैं।

कर्मचारियों को हिंदी शब्दों से परिचित करवाने हेतु संस्थान के मुख्य भवन में हररोज एक हिंदी शब्द और उसका अंग्रेजी समशब्द लिखा जाता है।

संस्थान से बाहर तथा आंतरिक ई-मेल्स द्विभाषी रूप में भेजे गये जिसके रिकार्ड के लिए फाइल बनाई गई है।

आवक रजिस्टर में प्रविष्टियाँ हिंदी में लिखी जाती हैं। सेवा-पुस्तिका में सभी प्रविष्टियाँ और हस्ताक्षर हिंदी में हैं।

उपस्थिती रजिस्टर में कर्मचारियों के नाम और हस्ताक्षर द्विभाषी होते हैं।

सभी प्रकार के रजिस्टर और फाइलों के शीर्षक द्विभाषी हैं।

विभिन्न विभागों/ अनुभागों से तिमाही प्रगति रिपोर्ट प्राप्त करने के लिए हिंदी गुगल फॉर्म बनाया गया है।

हिंदी भाषा में अधिक से अधिक टिप्पणियाँ लिखने के लिए कर्मचारियों को प्रोत्साहित किया गया जिससे अधिकतम लक्ष्य को प्राप्त किया जा सके।

संस्थान में साक्षात्कार के दौरान हिंदी भाषा का उपयोग करने का विकल्प रखा गया है।

संस्थान में विभिन्न बैठकों में वार्तालाप हिंदी में होता है।

संस्थान में हिन्दी कार्यशाला हेतु भारतीय फिल्म और टेलीविजन संस्थान, पुणे के हिंदी अधिकारी डॉ. अर्चना गौतम और हिंदी शिक्षण योजना, पुणे के सहायक निदेशक श्री. राजेन्द्र प्रसाद वर्मा को आमंत्रित किया गया।

डॉ. विश्वनाथ झा, पूर्व उपनिदेशक, राजभाषा विभाग, गृहमंत्रालय, भारत सरकार का ऑन-लाइन व्याख्यान आयोजित किया गया।

त्रैमासिक ई-पत्रिका 'संस्कृति' संस्करण कि प्रतिलिपि केंद्र सरकार के लगभग 90 कार्यालयों को ई-मेल द्वारा भेजी गई।

संस्थान के सभी विभाग/ अनुभाग के शीर्षक व्दिभाषी में है।

संस्थान में त्रैमासिक बैठकें नियमित रूप से आयोजित की गईं और उनसे संबंधित कार्यसूची तथा कार्यवृत्त हिंदी में जारी किए गए।

राजभाषा संबंधित निर्देशों से सभी विभाग/ प्रभाग प्रमुखों को समय-समय पर अवगत कराया जाता है।

प्रवेशद्वार पर संस्थान का नाम हिंदी में लिखा गया है।

वार्षिक प्रतिवेदन हिंदी और अंग्रेजी में प्रकाशित किया जाता है।

संस्थानकी वेब साइट को हिंदी तथा अंग्रेजी में प्रदर्शित किया गया है।

सभी कम्प्यूटरों पर सारांश और द्विभाषी सॉफ्टवेयर है।

संस्थानको प्राप्त तथा संस्थानसे बाहर भेजे जानेवाले सभी पत्रोंकी प्रविष्टियाँ हिंदी में की जाती है। क, ख, ग क्षेत्रों को भेजे जानेवाले पत्र तथा इन क्षेत्रों से प्राप्त हुए पत्रों की कुल संख्या जानने हेतु स्टैम्प बनाया गया है।

सभी साइनबोर्ड, नाम-पट्टों तथा रबर की मुहरें व्दिभाषी में है।

संस्थान में ऑन-लाइन हिंदी दिवस, हिंदी पखवाड़ा का आयोजन किया गया। पुस्तक प्रदर्शनी, निबंध प्रतियोगिता, स्वयं के शोध कार्यों का हिंदी में प्रस्तुतीकरण प्रतियोगिता, व्यंग-चित्र प्रतियोगिता आदि का आयोजन किया गया।

संस्थान में नियमित रूप से हिंदी कार्य में बढ़ोतरी करने का प्रयास जारी है।

## हिंदी पखवाड़ा

विगत वर्षों के भांती इस वर्ष भी संस्थान में भारत सरकार द्वारा कोरोना संबंधी जारी किये गये सभी दिशा-निर्देशों को ध्यान में रखते हुए राजभाषा हिंदी के प्रचार और प्रसार एवं उसे व्यापक बनाने हेतु दिनांक 14-28 सितंबर 2021 तक हिंदी पखवाड़ा मनाया गया। पखवाड़े के दौरान संस्थान में विभिन्न कार्यक्रम आयोजित किए गए। संस्थान के वैज्ञानिकों, कर्मचारियों एवं समस्त शोध छात्र-छात्राओं ने ऊर्जा, उत्साह, और उल्हास के साथ कार्यक्रम को सफल बनाने में योगदान दिया। पखवाड़े के दौरान संस्थान में निम्नलिखित कार्यक्रम आयोजित किए गये:

- हिंदी दिवस व्याख्यान (ऑनलाईन)
- शोध छात्र- छात्राओं द्वारा स्वयं के शोध कार्यों का सारांश लेखन प्रतियोगिता
- निबंध प्रतियोगिता: वैश्विक महाशक्ति की ओर अग्रसर भारत-संभावनाएँ एवं चुनौतियाँ
- व्यंग-चित्र प्रतियोगिता: ऑन लाईन शिक्षा प्रणाली



समाज माध्यमों से प्रसार

14 सितंबर 2021 को कार्यक्रम की शुरुआत में निदेशक महोदय ने राजभाषा प्रतिज्ञा दिलायी। ऑनलाइन व्याख्यान हेतु ओएनजीसी के पूर्व वैज्ञानिक एवं वरिष्ठ हिंदी साहित्यकार डॉ. ऋषिपाल धीमान जी को आमंत्रित किया था। राष्ट्रप्रगति के संदर्भ में हिंदी की प्रासंगिकता और उपादेयता इस विषय पर डॉ. ऋषिपाल धीमान का व्याख्यान हुआ।



डॉ. ऋषिपाल धीमान और श्रोता

**पखवाड़े के दौरान पुस्तकालय में हिंदी पुस्तकों की प्रदर्शनी आयोजित की गयी।**

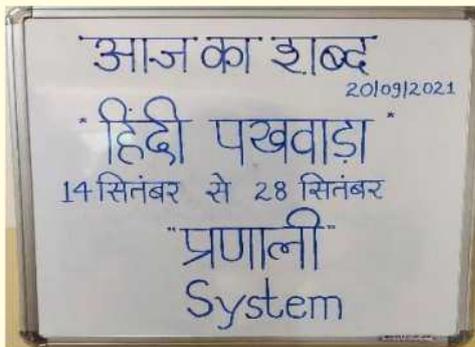


पुस्तकालय में आयोजित हिंदी पुस्तक प्रदर्शनी

हिंदी के विद्वानों और अन्य विख्यात व्यक्तियों की सूक्तियों के बोर्ड प्रदर्शित किए गए।



स्वयं के शोध कार्य का हिंदी में सारांश लेखन इस प्रतियोगिता में कुल 8 प्रतिभागियों ने हिस्सा लिया। सभी प्रतिभागियों के सारांश लेख सराहनीय थे। प्रथम विजेता के लिए रुपये 2100, द्वितीय विजेता के लिए रुपये 1500 और तृतीय विजेता को रुपये 1100 और प्रोत्साहन हेतु रुपये 500 का पुरस्कार दिया गया। जैव विविधता विज्ञान समूह की सुश्री शिवाली राणा को प्रथम पुरस्कार, नैनोजीव विज्ञान समूह के सुश्री स्नेहा देशमुख को द्वितीय और जैव विविधता समूह से ही सुश्री मल्लिका सुधार को तृतीय पुरस्कार से सम्मानित किया गया। अन्य दो प्रतिभागियों को प्रोत्साहन पुरस्कार प्रदान किये गये। नकद धनराशि के अतिरिक्त सभी विजेताओं को प्रशस्तिपत्र दिये गये।



संस्थान के मुख्य कार्यालय में प्रतिदिन आज का हिंदी शब्द और उसका अंग्रेजी प्रतिशब्द लिखा जाता है।

निबंध प्रतियोगिता का विषय था वैश्विक महाशक्ति की ओर अग्रसर भारत – संभावनाएँ एवं चुनौतियाँ। इस की शब्द सीमा 350 शब्द थी। कुल दस प्रतिभागियों ने हिस्सा लिया। निबंध प्रतियोगिता के पुरस्कार की राशि अनुक्रमे रुपये 1500, रुपये 1250 और रुपये 1000 रखी गयी। जैवपूर्वक्षण समूह की डॉ. गरिमा मिश्रा को प्रथम, पुस्तकालय के श्री. राहुल काले को द्वितीय और जैव विविधता (वनस्पति) समूह की सुश्री नम्रता गायकवाड को तृतीय पुरस्कार से सम्मानित किया गया। साथ ही अन्य दो प्रतिभागियों को प्रोत्साहन पुरस्कार दिये गये।



ऑनलाइन शिक्षा प्रणाली विषय पर व्यंग-चित्र प्रतियोगिता का आयोजन हुआ, जिसमें कुल 11 प्रतिभागियोंने हिस्सा लिया। व्यंग-चित्र प्रतियोगिता के प्रथम विजेता को रुपये 1500, द्वितीय विजेता को रुपये 1250 और तृतीय विजेता को रकम रुपये 1000 का पुरस्कार दिया गया।

विकासात्मक जीव विज्ञान समूह के श्री. किरण निलंगेकर को प्रथम, आनुवंशिकी एवं पादप प्रजनन समूह के सुश्री. सिध्दी किरण चव्हाण और जैवविविधता (कवक) समूह के श्री. अजय लगशेट्टी को द्वितीय तथा वित्त एवं लेखा अनुभाग के श्री. श्रीकांत चव्हाण को तृतीय पुरस्कार दिए गए।

हिंदी परखवाड़ा के समापन के अवसर पर दिनांक 28.9.2021 को डॉ. विश्वनाथ झा, पूर्व उपनिदेशक, राजभाषा विभाग, गृहमंत्रालय, भारत सरकार का ऑन-लाईन व्याख्यान आयोजित किया गया।

डॉ. झा ने माइक्रोसॉफ्ट वर्ड के आधुनिक फीचर्स तथा तकनीकी संदर्भ में हिंदी का भविष्य और भविष्य में हिंदी शैक्षिक विषय पर व्याख्यान दिया।

परखवाड़े के दौरान संपूर्ण 15 दिनों तक संस्थान में हिंदी से जुड़ी विभिन्न गतिविधियों की जानकारी फेसबुक, ट्विटर, इंस्टाग्राम खातों पर पोस्ट की गई।

## Events

### International Women's Day Celebration,

7 March 2022, Talks

Of Neurons Glia and Circuits, Dr Anuradha Ratnaparkhi, Scientist F

A Flash of the Past and a Sneak in the Future, Dr Jyutika Rajwade, Scientist F

Value Addition to Natural Products, Dr Garima Mishra, DST-WOSA

Nanoparticles Modified as a Substrate for DNA Polymerase, Dr Pratibha Jhaba, DST-INSPIRE Faculty

My entrepreneurial dream, Ms Snehal Jamalpure-Lakka

Science Story, Ms Suhasini Venkatesan

Science Story, Ms Komal Suryavanshi

You are next, Dr Anupama Engineer, CEO, Weinovate Biosolutions Pvt Ltd, Pune

My journey beyond Agharkar Research Institute, Prof. Meenal Kowshik, Biological Sciences, BITS Pilani, Goa

8 March 2022, Felicitation of Women Scientists

Dr Vidya Gupta, Emeritus Scientist and Former Head Biochemical Sciences Division, CSIR-NCL, Pune

Prof Smita Zinjarde, Director, School of Life Sciences, SPPU and Head, Department of Biotechnology, SPPU,

Talk - Yarrowia lipolytica and pollutants: Interactions and applications

### Vigilance Awareness Week, 26 October-1 November 2021

26<sup>th</sup> October 2021, Integrity Pledge

1 November 2021, Independent India@75: Self Reliance with Integrity, Shri. Sayyid Rabeehashmi, Registrar, FTII, Pune

Display of hoarding, banners in the Institute.

### India International Science Festival, 10-13 December 2021

Dr Tushar Kaushik and Dr Soham Pore represented ARI at the 7<sup>th</sup> IISF held at Campal, Panaji, Goa

### Prof. SP Agharkar Memorial Oration, 18 November 2021

Peptide-Based Strategies in Chemical Neuroscience

Prof. Sandeep Verma, Secretary,

Science and Engineering Research Board, DST, New Delhi

### Release of Books

Practical Guidebook to Actinomycete Biology and Technology Application, Authors - Dr MC Srinivasan and Dr SK Singh

Seed Morphology of High-Value Medicinal Plants, Authors - Dr Vinaya Ghate and Namrata Gaikwad

The programme was presided by Prof. NR Karmalkar, Vice-Chancellor, SPPU, Pune

### National Science Day, 28 February 2022

### Talks by awardees of

#### Yogamaya Devi Award in Biomedical Sciences

Biomedical Nanotechnology, Dr Gopinath Packirisamy, Professor Head, Centre for Nanotechnology, Department of Biosciences & Bioengineering, Indian Institute of Technology, Roorkee

Bacterial Lifestyles: Their ways and strategies, Dr Dipshikha Chakravorty, Professor, Department of Microbiology & Cell Biology, Indian Institute of Science, Bangalore

#### Dr RB Ekbote Prize

Genetics – Its Trajectories and Applications in Modern Biology, Dr. Sanjeev K. Deshpande, Professor, Department of Genetics & Plant Breeding, College of Agriculture, UAS, Dharwad

Release of the Biography of Dr GB Deodikar written by Dr KK Kshirsagar

## Institutional Research Projects

Sl. No.	Code	Title	Investigators	Staff
<b>Biodiversity &amp; Palaeobiology</b>				
<b>Plants &amp; Diatoms</b>				
1	BD-07	Diatom herbarium and culture collection	Karthick B	Wadmare N
2	BOT-15	Digitizing AHMA	Datar MN	Bokil S
3	BOT-17	Repository of crude drugs, and authentication services	Choudhary RK Kulkarni PP	Gaikwad NS Kadu M

Sl. No.	Code	Title	Investigators	Staff
<b>Fungi</b>				
	MYC-02	National Facility – Repositories and service (NFCCI, AMH, and Identification Service)	Singh SK Singh PN Rajeshkumar KC Bhagela A	Maurya D Lad S
<b>Palaeobiology</b>				
4	BD-03	Modernization of fossil repository (Ongoing Core activity)	Kaushik Tushar	Rana H
<b>Developmental Biology</b>				
5	ZOO-18	Identification and functional analysis of novel regulators during heart development and regeneration	Patra C	Bojja S

## Sponsored Projects

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
1	ARI/SP/001	"All India Co-ordinated Research Project on Soybean" (01.04.1968 onwards)	ICAR-IISR, Indore	Mr. S.A. Jaybhay
2	ARI/SP/002	All India Co-ordinated Fruit Improvement Project (01.10.1970 onwards)	ICAR-AICRP (Fruits), Bengaluru	Dr. Sujata Tetali
3	ARI/SP/003	All India Co-ordinated Wheat Improvement Project (01.04.1972 onwards)	ICAR-IIWBR, Karnal	Dr. Yashavanthakumar K.J.
4	ARI/SP/033	Production of Soybean Breeder Seeds of Annual Oil Seed Crops (02.02.1988 onwards)	ICAR, New Delhi	Mr. S.A. Jaybhay
5	ARI/SP/034	Front-line Demonstrations of Annual Oil Seed Soybean (21.02.1989 onwards)	ICAR-IISR, Indore	Mr. S.A. Jaybhay
6	ARI/SP/043	Front-line Demonstrations in Wheat (01.04.1993 onwards)	ICAR-IIWBR, Karnal	Dr. V.S. Baviskar
7	ARI/SP/096	Wheat Breeder Seed Scheme (1995 Onwards)	ICAR, New Delhi	Dr. Yashavanthakumar K.J.
8	ARI/SP/256	"Investigate the role Autophagy in stem cell maintenance and aging" (25.05.2016 to 24.05.2021) (Extended upto 31.07.2021)	DBT, New Delhi	Dr. B.V. Shravage
9		CSIR ES SCHEME "Role of BMP signaling inhibitors Noggin and Gremlin in pattern formation in hydra" (02.05.2016 to 01.05.2019) (Extended upto 31.05.2021)	CSIR, New Delhi	Dr. S.M. Ghaskadbi
10	ARI/SP/266	"Deciphering the past environmental conditions of freshwater myristica swamps of Western Ghats using Diatom assemblages" (10.04.2017 to 09.04.2020) (Extended upto 30.09.2021)	Ministry of Earth Sciences, New Delhi	Dr. Karthick Balasubramanian

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
11	ARI/SP/268	"Conservation of Selected endemic species of orchids of northern western ghats through ex-situ multiplication and reintroduction in wild" (03.05.17 to 02.05.2020) (Extended upto 31.08.2022)	TATA Power Corporation, Mumbai	Dr. M.N.Datar & Dr. A.S. Upadhye
12	ARI/SP/276	"Elucidating the potential of anaerobic rumen fungi for enhancing biomethanation in anaerobic digesters fed on agricultural wastes" (29.11.2017 to 28.11.2020) (Extended upto 31.10.2021)	DBT, New Delhi	Dr. Sumit Dagar
13	ARI/SP/278	"Determine the role of autophagy in Germline stem cell maintenance" (31.01.2018 to 30.01.2021) (Extended upto 30.04.2021)	DBT, New Delhi	Dr. B.V. Shrivage
14	ARI/SP/280	"Role of Dmon 1 at the synapse and regulation of glutamate receptors." (21.03.2018 to 20.03.2021) (Extended upto 20.09.2021)	DBT, New Delhi	Dr. Anuradha Ratnaparkhi
15	ARI/SP/281	"Pyramiding of Rust Resistance Genes into High Grain Quality Wheat Lines Developed Through Marker-assisted Selection" (19.03.2018 to 18.03.2021) (Extended upto 18.06.2022)	DBT, New Delhi	Dr. M.D. Oak
16	ARI/SP/282	"Bioresource and Sustainable livelihoods in North East India" (29.03.2018 to 28.03.2021) (Extended upto 28.09.2021)	DBT, New Delhi	Dr. Karthick Balasubramanian
17	ARI/SP/283	"Digitization and Dissemination of Lichen Specimens at Ajrekar Mycological Herbarium (AMH)" (05.05.2018 to 04.05.2021) (Extended upto 28.02.2022)	RGSTC, Mumbai	Dr. Bharati Sharma
18	ARI/SP/285	"Methane oxidizing bacteria : Community structure, elucidation and cultivation from Indian lowland rice ecosystems for future applications" (05.09.2018 to 04.09.2021) (Extended upto 31.03.2022)	DST, New Delhi	Dr. Pranitha Pandit
19	ARI/SP/286	"Valorization of methane from biogas to biodiesel and single cell proteins (SCPs) using methanotrophs (methane oxidizing bacteria)" (15.09.2018 to 14.09.2021) (Extended upto 14.12.2021)	SERB, New Delhi	Dr. Monali Rahalkar
20	ARI/SP/287	"Nanoparticles mediated dsRNA delivery for biocontrol of the polyphagous insect pests, Helicoverpa armigera (armyworm) and Scirtothrips dorsalis (thrips)" (02.11.2018 to 01.11.2021)	SERB, New Delhi	Dr. Vandana Ghormade

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
21	ARI/SP/288	"Effect of amyloid beta peptide on intracellular copper metabolism: Implications to inflammation and neuro-degeneration" (12.03.2019 to 11.03.2022)	SERB, New Delhi	Dr. Prasad Kulkarni
22	ARI/SP/289	"Microbial Production of Hydrogen from Rice Straw" (Upto 06.03.2020) (Extended upto 09.05.2022)	KPIT Technologies Ltd., Pune	Dr. P.K.Dhakephalkar
23	ARI/SP/291	"Understanding the conidial anastomosis tube (CAT) fusion dynamics and its role in generating genetic diversity in a fungal pathogen Colletotrichum gloeosporioides" (30.03.2019 to 29.03.2022)	SERB, New Delhi	Dr. S.K. Singh (Dr. Abhishek Baghela)
24	ARI/SP/292	"Mapping genes/QTL for resistance to spot blotch and stem rust in durum wheat" (26.03.2019 to 25.03.2022) (Extended upto 25.09.2022)	SERB, New Delhi	Dr. R.M. Patil
25	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" (25.03.2019 to 24.03.2022) (Extended upto 17.09.2022)	DBT, New Delhi	Dr. M.D. Oak
26	ARI/SP/294	"Development, evaluation and molecular characterization of a seedless mutant in Grapes variety ARI 516" (30.03.2019 to 29.03.2022) (Extended upto 29.11.2022)	SERB, New Delhi	Dr. Sujata Tetali
27	ARI/SP/295	"A chromogenic immunosensor for rapid detection of Vibrio spp. in aquaculture" (25.04.2019 to 24.04.2021) (Extended upto 24.10.2021)	SERB, New Delhi	Dr. Madhuri Keshavrao Pawar
28	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	Mr. S.A. Jaybhay
29	ARI/SP/297	"Crispr- Cas9 based genome-editing approach to explore functions of Actin Binding Proteins in zebrafish: Unravelling F-actin regulation underlying behaviour of cells, tissues and animals" (02.05.2019 to 01.05.2022) (Extended upto 01.05.2023)	DBT, New Delhi	Dr. Chinmoy Patra
30	ARI/SP/298	"Exploration of cryptic genetic diversity in extant planktic foraminiferal morphospecies from the Southern Indian Ocean" (21.08.2019 to 20.08.2022) (Extended upto 31.03.2023)	National Centre for Polar and Ocean Research, Goa	Dr. Tushar Kaushik

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
31	ARI/SP/299	"Microchip for bacterial separation, DNA extraction and multiplexed detection using LAMP" (10.08.2019 to 09.08.2022)	ICMR, New Delhi	Dr. Dhananjay Bodas
32	ARI/SP/300	"Production, nano-delivery and validation of viral vaccine against nodavirus of fish" (24.09.2019 to 23.09.2022)	DBT, New Delhi	Dr. K.M. Paknikar Dr. J.M. Rajwade
33	ARI/SP/301	"Synthesis of small molecules based on redox active natural products and their evaluation as antimicrobial agents" (15.10.2019 to 30.06.2021)	DST, New Delhi	Dr. Ritu Mamgain
34	ARI/SP/302	"Exploration of pro-regenerative secreted molecules and their mechanistic details in heart regeneration using zebrafish as a model organism" (01.10.2019 to 30.09.2024)	IndiaAlliance, DBT wellcome, Hyderabad	Dr. Chinmoy Patra
35	ARI/SP/303	"Understanding Enzymatic Mechanism of Fungal and Algal Growth on Paint Film" (15.11.2019 to 14.11.2020) (Extended upto 30.06.2021)	Asian Paints Limited, Navi Mumbai	Dr. S.K. Singh
36	ARI/SP/304	"Validating the performance of pharmaceutical aerosols by multi-scale simulations and analytical experiments" (11.11.2019 to 10.11.2022)	SERB, New Delhi	Dr. Bothiraja Chellampillai Dr. J.M. Rajwade
37	ARI/SP/305	"Augmentation of Cordycepin by Optimizing In vitro Culture Conditions of Caterpillar Fungi" (30.10.2019 to 29.10.2022)	SERB, New Delhi	Dr. Mahesh Yashwant Borde Dr. S.K. Singh
38	ARI/SP/306	"Exploring the role of Chemokine Receptor 3.1 (Cxcr3.1) in zebrafish heart regeneration using genetic and chemical tools" (31.12.2019 to 30.12.2021) (Extended upto 29.06.2022)	SERB, New Delhi	Dr. Himanshu
39	ARI/SP/307	"Revisiting the traditional biomethanation: Replacing cattle dung with fibrolytic anaerobic fungi and methanogenic archaea in light of multi-omics approaches" (09.01.2020 to 08.01.2022) (Extended upto 08.06.2022)	SERB, New Delhi	Dr. Kriti Sengupta
40	ARI/SP/309	"Understanding the regulation of Fog dependent GPCR signaling in the Drosophila CNS" (15.02.2020 to 14.02.2023)	SERB, New Delhi	Dr. Anuradha Ratnaparkhi
41	ARI/SP/310	"Characterisation of Genetic Resources: Germplasm Characterization and Trait Discovery in Wheat using Genomics Approaches and its Integration for Improving Climate Resilience, Productivity and Nutritional quality" "Sub Project-3:Evaluation of wheat germplasm for abiotic stresses" (29.02.2020 to 28.02.2025)	DBT, New Delhi	Dr. YashavanthaKumar K.J

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
42	ARI/SP/311	"10-minute paper-based test kit to detect SARS-CoV-2" (06.07.2020 to 05.07.2021) (Extended upto 05.10.2021)	SERB, New Delhi	Dr. Yogesh Karpe Dr. Virendra Gajbhiye Dr. P.K. Dhakephalkar Dr. D. Bodas
43	ARI/SP/312	"Exploration of triterpenoid metabolite from endophytic fungi of different genotypes of Neem for applications in agriculture" (21.08.2020 to 20.05.2021) (Extended upto 20.08.2021)	Nextnode Bioscience Pvt. Ltd., Kadi - Gujrat	Dr. S.K. Singh
44	ARI/SP/313	"SRB-lytic Bacteriophage Mediated Inhibition of SRB Growth and/ or H <sub>2</sub> S Production at Pre-pilot scale : Prototype Development and Feasibility Assessment" (15.10.2020 to 14.10.2022)	OECT, New Delhi	Dr. P.K.Dhakephalkar
45	ARI/SP/314	"Studies on Selected Crinum species from Maharashtra for their Bioprospecting potential against Alzheimer's disease" (08.10.2020 to 07.10.2023)	RGSTC, Mumbai	Dr. P.P. Kulkarni
46	ARI/SP/315	"Evaluation of bioprospecting potential of naturally occurring flavonoids their derivatives and inclusion complexes with biodegradable macromolecules" (17.12.2020 to 16.12.2023)	DST, New Delhi	Dr. Garima Mishra
47	ARI/SP/316	"Unravelling the symbiosis of algal and fungal partners in lichen family Graphidaceae and Parmeliaceae from the Western Ghats through polyphasic taxonomic approach and ecological studies" (30.12.2020 to 29.12.2023)	SERB, New Delhi	Dr. Rajesh Kumar K.C.
48	ARI/SP/317	"Revisiting the taxonomy of the wild relatives of Sarsaparilla (Smilax L.) in India, developing super-barcodes, and understanding their diversification using phylogenomic tools" (30.12.2020 to 29.12.2023)	SERB, New Delhi	Dr. Ritesh Kumar Choudhary
49	ARI/SP/318	"Determine the mechanism of Autophagy-related gene-1 (Atg1) mediated regulation of mitochondrial dynamics during Drosophila oogenesis" (30.12.2020 to 29.12.2023)	SERB, New Delhi	Dr. B.V. Shrivage
50	ARI/SP/319	"Fine mapping and marker-assisted breeding for alternative dwarfing genes Rht14 and Rht18 to develop semidwarf wheat genotype suitable for conservation agriculture" (01.01.2021 to 31.12.2023)	ICAR-National Agricultural Science Fund (NASF), New Delhi	Dr. R.M. Patil
51	ARI/SP/320	"Development of new approaches to live attenuated vaccine against Chikungunya virus" (31.12.2020 to 30.12.2023)	SERB, New Delhi	Dr. Yogesh Karpe

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
52	ARI/SP/321	"Analysis & characterization of probiotic properties of microbial cultures provided by HTBS" (01.02.2021 to 31.01.2024)	Hi Tech BioSciences India Pvt. Ltd., Pune	Dr. P.K.Dhakephalkar
53	ARI/SP/322	"Exploring the role of mitophagy modulators in Parkinson's disease using Drosophila melanogaster" (14.01.2021 to 13.01.2023)	SERB, New Delhi	Dr. Jyotsna Asthana
54	ARI/SP/323	"Translation of proven rapid hemostatic dressing 'Hemo-halt gauze and gel' Prototypes from laboratory to a commercially viable product" (02.02.2021 to 01.02.2023)	DBT, New Delhi	Dr. Vandana Ghormade
55	ARI/SP/324	"Multi-omic characterization of oral biofilm on novel silver-nanocoated and control smooth titanium implant-abutment surfaces" (06.02.2021 to 05.02.2022)	Dr. D.Y. Patil Dental College & Hospital, Pimpri	Dr. J.M. Rajwade
56	ARI/SP/325	"Modulation of splicing via aptamer guided targeted nanoconstructs for oncogene RNA repair in triple-negative breast cancer" (25.08.2021 to 24.08.2024)	ICMR, New Delhi	Dr. Virendra Gajbhiye
57	ARI/SP/326	"Accelerating Genetic Gains in Maize and Wheat for Improved Livelihood (AGG)" (04.10.2021 to 03.10.2024)	Bill & Melinda Gates Foundation (BMGF) and the United Kingdom's Department for International Development (DFID)	Dr. YashavanthaKumar K.J Dr. Sudhir Navathe
58	ARI/SP/327	"Nano-mediated rapid detection and biocontrol of downy and powdery mildew of grapes and powdery mildew of tomatoes" (01.12.2021 to 30.11.2024)	DBT, New Delhi	Dr. Vandana Ghormade
59	ARI/SP/328	"Phylogeny, Diversification and Biogeography of Gomphonemoid Diatoms in the Western Ghats Biodiversity Hotspot, India: A model system for eukaryotic microbes" (20.12.2021 to 19.12.2024)	SERB, New Delhi	Dr. Karthick Balasubramanian
60	ARI/SP/329	"Development of functional GluN1/GluN2B-NMDAR antagonists for the treatment of Alzheimer's disease" (06.12.2021 to 05.12.2024)	SERB, New Delhi	Dr. Vinodkumar Ganpatrao Ugale Dr. P.P. Kulkarni
61	ARI/SP/330	"Methane Oxidation Potential and Associated Methanotrophic Bacterial Community of Tropical Moist Deciduous Forest and Grassland Soils of Terai Ecozone" (30.12.2021 to 29.12.2024)	SERB, New Delhi	Dr. Monali Rahalkar

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
62	ARI/SP/331	"Reassessment of the taxonomic relationship in the genus Ammonia (Foraminifera) using a combined morphological, ecological, and molecular systematic approaches from around India's coastline" (21.01.2022 to 20.01.2025)	SERB, New Delhi	Dr. Tushar Kaushik
63	ARI/SP/332	"Dissection of diversity and complex mechanism of Bipolaris sorokiniana infections in wheat using ToxA-Tsn1 interaction" (28.01.2022 to 27.01.2025)	SERB, New Delhi	Dr. R.M. Patil Dr. YashavanthaKumar K.J Dr. Sudhir Navathe
64	ARI/SP/333	"Anticancer activity of bioactive compounds from medicinal mushrooms of Western Ghats of Maharashtra" (13.12.2021 to 12.12.2024)	SERB, New Delhi	Dr. Hiralal Bhaskar Sonawane Dr. B.C. Behera
65	ARI/SP/334	"Assessment of potential of multifunctional microbial metabolites in developing 'smart' bandages for treatment of supercial wounds" (13.12.2021 to 12.12.2024)	SERB, New Delhi	Dr. Girish Bhikanrao Pendharkar Dr. J.M. Rajwade
66	ARI/SP/335	"Development of inhalation nanoformulation for bimodal delivery of antifungal cell wall and cell membrane inhibitors against Aspergillus lung infections for reduced systemic toxicity and effective treatment" (02.03.2022 to 01.03.2025)	ICMR, New Delhi	Dr. Vandana Ghormade

## Personnel

### Director

Dr. P.K. Dhakephalkar

### Biodiversity & Paleobiology Group

#### Biodiversity - Fungi

Dr. S.K. Singh, Scientist 'F'

Dr. Rajesh Kumar K.C., Scientist 'D'

Dr. P.N. Singh, Scientist 'D'

S. B. Gaikwad, Technical Officer 'A'

D.K. Mourya, Laboratory Assistant 'D'

S.S. Lad, Laboratory Assistant 'D'

#### Biodiversity - Lichens

Dr. B.C. Behera, Scientist 'E'

Dr. B.O. Sharma, Technical Officer 'C'

### Biodiversity - Palaeobiology

Dr. T. Kaushik, Scientist 'C'

Dr. P.G. Gamre, Technical Officer 'B'

S. S. Deshmukh, Laboratory Assistant 'E'

### Biodiversity - Plants and Diatoms

Dr. R.K. Chaudhary, Scientist 'E'

Dr. Karthick B, Scientist 'E'

Dr. M.N. Datar, Scientist 'D'

M.H. Mhetre, Laboratory Assistant 'D'

N.S. Gaikwad, Laboratory Assistant 'C'

S. A. Pardhi, Laboratory Assistant 'B'

### Garden

K. H. Sable, Technical Officer 'B'

S. N. Gajbhar, Attendant 'D'

M.T. Gurav, Attendant 'D'

**Bioenergy Group**

Dr. M.C. Rahalkar, Scientist 'E'  
 Dr. S.S. Dagar, Scientist 'D'  
 P.R. Kshirsagar, Scientist 'D'  
 A.S. Kelkar, Technical Officer 'C'  
 Dr. V.B. Lanjekar, Technical Officer 'B'

**Bioprospecting Group**

Dr. P.P. Kulkarni, Scientist 'E'  
 Dr. P. Srivastava, Scientist 'C'  
 Dr. R.J. Waghole, Technical Officer 'A'  
 Dr. A.V. Misar, Technical Officer 'A'

**Developmental Biology Group**

Dr. A. Ratnaparkhi, Scientist 'F'  
 Dr. C. Patra, Scientist 'D'  
 Dr. B.V. Shrivage, Scientist 'D'  
 M. B. Daware, Technical Officer 'C'  
 R. J. Londhe, Technical Officer 'B'  
 A. A. Nikam, Laboratory Assistant 'B'

**Genetics & Plant Breeding Group**

Dr. M. D. Oak, Scientist 'E'  
 Dr. R. M. Patil, Scientist 'D'  
 Dr. S. P. Tetali, Scientist 'D'  
 S. A. Jaybhay, Scientist 'D'  
 A. M. Chavan, Scientist 'C'  
 Dr. Y. Kumar K.J., Scientist 'C'  
 Dr. V. S. Baviskar, Scientist 'C'  
 Dr. S.P. Nawathe, Scientist 'C'  
 V. M. Khade, Technical Officer 'C'  
 V. D. Surve, Technical Officer 'C'  
 J. H. Bagwan, Technical Officer 'B'  
 B. D. Idhol, Technical Officer 'B'  
 S. V. Phalake, Technical Officer 'A'  
 V. D. Gite, Technical Officer 'A'  
 B. N. Waghmare, Technical Officer 'A'  
 A. A. Deshpande, Technical Officer 'A'  
 S. S. Khairnar, Technical Assistant 'B'

J.S. Sarode, Laboratory Assistant 'D'  
 D. H. Salunkhe, Laboratory Assistant 'D'  
 D. N. Bankar, Laboratory Assistant 'C'  
 S. R. Kachhi, Attendant 'C'  
 S. V. Ghadge, Attendant 'B'  
 D. L. Kolte, Attendant 'B'  
 G. S. Rajguru, Attendant 'B'  
 T. B. Dhurve, Attendant 'A'

**Nanobioscience Group**

Dr. J.M. Rajwade, Scientist 'F'  
 Dr. D.S. Bodas, Scientist 'E'  
 Dr. V. Ghormade, Scientist 'E'  
 Dr. V. Gajbhiye, Scientist 'E'  
 Dr. Y. A. Karpe, Scientist 'D'  
 R.G. Bambe, Technical Officer 'A'  
 A. Dwivedi, Technical Assistant 'B'  
 S.S. Waghmare, Laboratory Assistant 'C'

**Animal House**

Dr. J.M. Rajwade, Scientist 'F'-In-Charge  
 Dr. S.H. Jadhav, Scientist 'D'  
 V.M. Gosavi, Attendant 'B'

**Director Office**

Dr. G.K. Wagh, Technical Officer 'D'  
 J. V. Deshpande, Private Secretary  
 Dr. P.P. Apte, Laboratory Assistant 'C'  
 S.P. Balsane, Attendant 'B'

**Administration Unit**

A. Rahman, Administrative Officer  
 C. D. Nagpure, Officer 'B'  
 A.G. Dhongade, Senior Private Secretary  
 M. B. Tiwari, Officer 'A'  
 T.V. Kurhade, Assistant 'A'  
 D.V. Gawade, Assistant 'A'  
 R.B. Dhobale, Assistant 'A'  
 S.S. Shah, Assistant 'A'  
 R.S. Shinde, Assistant 'A'

R.M. Dhandhore, Assistant 'C'

A.B. Kusalkar, Driver

G.H. Agawan, Driver

### Accounts Unit

D.K. Sharma, Finance and Accounts Officer

S.A. Tembe, Officer 'B'

A.D. Joshi, Officer 'B'

M. C. Ranjane, Assistant 'B'

M.V. Patake, Assistant 'A'

S.S. Chavan, Assistant 'A'

R.G. Birwadkar, Assistant 'A'

S. R. Murade, Assistant 'A'

K.R. Sathe, Attendant 'C'

### Purchase Unit

P.V. Gosavi, Stores & Purchase Officer

V.G. Tallu, Officer 'A'

S.S. Kalekar, Assistant 'B'

P. D. Gagare, Assistant 'A'

A.V. Wable, Assistant. 'A'

A.T. Salvi, Attendant. 'C'

### Store Unit

H.N. Mate, Officer 'B'

S.A. Shaikh, Assistant. 'A'

P. S. Velankar, Assistant. 'A'

R M. Salunke, Attendant 'D'

### Engineering Unit

M. Kharade, Technical Officer 'C'

P.V. Sawant, Technical Officer 'B'

D.S. Shinde, Technician 'B'

Nayankumara D, Technician 'B'

### Library & Information Center

R.P. Janrao, Assistant Library & Information Officer

S.A. Deshmukh, Senior Library Assistant

R.R. Kale, Library & Information Assistant

### Appointment

D. K. Sharma, Finance and Accounts Officer

### Promotion

#### Scientific Staff

Dr. V. Gajbhiye, Scientist 'E'

Dr. M. C. Rahalkar, Scientist 'E'

Dr. R. K. Choudhary, Scientist 'E'

Dr. Karthick B, Scientist 'E'

S.A. Jaybhay, Scientist 'D'

Dr. S.P. Nawathe, Scientist 'C'

#### Technical Staff

M. B. Daware, Technical Officer 'C'

Dr. B.O. Sharma, Technical Officer 'C'

B.D. Idhol, Technical Officer 'B'

D.H. Salunkhe, Laboratory Assistant 'D'

A.A. Nikam, Laboratory Assistant 'B'

S.A. Pardhi, Laboratory Assistant 'B'

#### MACP

H.N. Mate, Officer 'B'

V.G. Tallu, Officer 'A'

M.V. Patake, Assistant 'A'

T.V. Kurhade, Assistant 'A'

D.V. Gawade, Assistant 'A'

#### NTM Staff

K.R. Sathe, Attendant 'C'

G.S. Rajguru, Attendant 'B'

S.P. Balsane, Attendant 'B'

#### Superannuation

A.V. Choudhary, Technical Officer 'D', 31.07.2021

Dr. K.G. Kulkarni, Scientist 'E', 31.10.2021

S.P. Karkamkar, Technical Officer 'B', 31.10.2021

#### Voluntary Retirement

S.L. Bhandalkar, Attendant 'C', 11.11.2021

**Deceased**

K.V. Tiwari, Attendant 'B' - 05.09.2021

**Resignation**

Dr. A. Baghela, Scientist 'D', 26.10.2021

**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 2021-2022

Group	SC	ST	OBC	EWS	General	Total
<b>A</b>	--	--	--	--	01	01
<b>B</b>	--	--	--	--	--	--
<b>C</b>	--	--	--	--	--	--
<b>Total</b>	--	--	--	--	01	01

**Emeritus Scientist, Project Staff****CSIR Emeritus Scientist**

Dr. S.M. Ghaskadbi

**Fellows**

Dr. Himansu, SERB-NPDF

Dr. Kriti Sengupta, SERB-NPDF

Dr. Mahesh Y. Borde, SERB-TARE (Botany, SPPU, Pune)

Dr. Bothiraja Chellampillai, SERB-TARE (Poona Coll. Pharmacy)

Dr. J. Asthana SERB-NPDF

Dr. Garima Misra, DST-WOS-A

Dr. Pratibha, DST-INSPIRE-Faculty

Dr. Madhuri Pawar (DST-SERB)

Dr. Girish Pendharkar (DST-TARE)

**Project Scientist****Sponsored Project**

Dr. Soham Pore

**Research Associate****ARI Sponsored Project**

Dr. Deepa Shetty

**Senior Research Fellow****Sponsored Project**

Suhasini Venkatesan

**Junior Research Fellows****ARI Projects**

Kunal Kishor Yadav

Monali S. Kadu

**Sponsored Projects**

Minal Sunil Ayachit

Sumit Phakatkar

Priyanka Jagdish Pawar

Siddhi K. Chavan

Mangesh S. Rajguru

Tejal Madalkar

Shubha Manvi

Iris George

Geetika Sukharamani

Ashwini Raiaram Punde

Aazam Shaikh Bashiruddin

**Research Students****ARI Projects**

Harshita Rana

Sarang A. Bokil

**Sponsored Projects**

Rutuja R. Pawar

**Project Technical Assistant****ARI Project**

Ashwini Gund

Harshada R. Kadam

Sharvari Kulkarni

**Project Assistants****ARI Project**

Bojja Satish

**Sponsored Projects**

M. Yogeshwaran

Pravin Pawar

Vigneshwaran A.

Prajakta Maragale

Kartik Adke

**Project Mali****Sponsored Project**

Shivaji A. Parvate

**Field Worker Project**

Yogesh Nilakhe

**Field Assistant Project**

Sonali Pawar

### **Fellows with Own Fellowship**

#### **CSIR Senior Research Fellows**

Smrithy Vijayan  
Nidhi Nirola Murmu  
Ajay Lagashetty  
Pravinkumar Methe  
Neha Wadmare  
Nikhil Astekar

#### **CSIR Junior Research Fellows**

Pooja Salunke  
Snehal Jamalpure  
Ganesh Wagh  
Payal Deshpande  
Malika Suthar  
Komal Suryavanshi  
Mrunmayee Kulkarni  
Ansil P A  
Jyothish S.  
Shruthi O P  
Pratyasha Nayak

#### **UGC Senior Research Fellows**

Sonali Kawade  
Snigdha Tiwari  
Kadambari Pawar  
Rajesh Salve

#### **UGC Junior Research Fellows**

Shiwali Rana  
Kalyani Deshmukh  
Padmaja Anil Shete  
Ruchira R. Sutar  
Pooja G. Suryavanshi  
Tanmayee M Sathe  
Swapanja Gulavni  
Prajakta Bhujbal  
Tabbasum Nadaf  
Karan Selarka  
Rohini Nangare  
Aditi Sarawgi  
Surajit Patra  
Vasudha Dwivedi  
Deepali Choudhary

#### **DBT Senior Research Fellow**

Parimal Vikhe

### **DBT Junior Research Fellow**

Sachin Mapari  
Ms. Snehal Kulkarni  
Niladri Haldar

### **DST-INSPIRE Senior Research Fellows**

Aishwarya Padhye

### **DST-INSPIRE Junior Research Fellows**

Vaidehi S. Pisu  
G. Maheswari

### **ICMR Senior Research Fellow**

Kiran Nilangekar

### **SARTHI Junior Research Fellow**

Bhushan K. Shigwan  
Jyoti Arun Mohite

### **DST KARYA Fellow**

Bharti Soni

# Audit Report 2021-22

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 31<sup>st</sup> March, 2022 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<sup>st</sup> March 2022.
  - 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 **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**Nikhil Gugale**  
Partner  
M. NO. 177609

Place: Pune  
Date: 27-Jun-2022

**REPORT OF AN AUDITOR RELATING OF 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 31<sup>st</sup> March, 2022

Sr. No.	Particulars	Remarks
A	Whether accounts are maintained regularly and in accordance with the provisions of the Act and the rules.	YES
B	Whether receipts and disbursements are properly and correctly shown in the accounts.	YES
C	Whether the cash balance and vouchers in the custody of the manager or trustee on the date of audit were in agreement with the accounts.	YES
D	Whether all books, deeds, accounts, vouchers or other documents records required by the auditor were produced before him.	YES
E	Whether a register of movable and immovable properties is properly maintained, the changes therein are communicated from time to time to the regional office and the defects and inaccuracies mentioned in the previous audit report have been duly complied within.	YES
F	Whether the manager or trustee or any other person required by the auditor to appear before him did so and furnished the necessary information required by him.	YES
G	Whether any property or funds of the Trust were applied for any object or purpose other than the object or purpose of the Trust	NO
H	Whether tenders were invited for repairs or construction involving expenditure exceeding Rs. 5000/	YES
I	Whether any money of the public trust has been invested contrary to the provisions 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 **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

Place: Pune  
Date: 27-Jun-2022

**Nikhil Gugale**  
Partner  
M. NO. 177609

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

**BALANCE SHEET AS ON 31.03.2022**

Amount - Rs.

<b>FUNDS AND LIABILITIES</b>	<b>SCH.</b>	<b>CURRENT YEAR</b>	<b>PREVIOUS YEAR</b>
CAPITAL ACCOUNTS	<b>A</b>	1,07,61,721	1,07,61,721
CURRENT LIABILITIES	<b>B</b>	34,48,427	37,72,987
INCOME & EXP.A/C (Sub Schedule 4)		1,83,12,950	1,73,19,105
<b>TOTAL</b>		<b>3,25,23,098</b>	<b>3,18,53,813</b>

<b>PROPERTY AND ASSETS</b>	<b>SCH.</b>	<b>CURRENT YEAR</b>	<b>PREVIOUS YEAR</b>
FIXED ASSETS	<b>C</b>	92,03,662	92,50,932
INVESTMENTS	<b>D</b>	1,84,50,001	1,81,93,436
DEPOSITS & ADVANCES	<b>E</b>	35,42,874	38,31,628
CASH & BANK BALANCES	<b>F</b>	13,26,561	5,77,817
<b>TOTAL</b>		<b>3,25,23,098</b>	<b>3,18,53,813</b>

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 **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**HON. F.& A.O.**  
M.A.C.S.

**HON. Treasurer**  
M.A.C.S.

**HON. Secretary**  
M.A.C.S.

**Nikhil Gugale**  
Partner  
M. NO. 177609

Place: Pune

Date: 27-Jun-2022

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

**INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31.03.2022**

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	59,052	99,824
			On Investments	8,51,684	10,30,692
			On HDFC S.B. A/c	15,768	-
Establishment Expenses (As per Schedule H)	2,05,665	1,95,796	Donation	-	-
Audit fees	-	3,540	Income from other Sources (As per Schedule L)	4,51,492	500
			Income tax refund received (Interest)	4,675	-
Depreciation : Furniture & Dead Stock	44,306	19,699			
Expenditure on the object of The Trust (As per Schedule I)	75,891	5,55,000			
Surplus carried over to Balance sheet	10,53,845	3,54,016			
<b>TOTAL</b>	<b>13,82,671</b>	<b>11,31,016</b>	<b>TOTAL</b>	<b>13,82,671</b>	<b>11,31,016</b>

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 **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**HON. F.& A.O.**  
M.A.C.S.

**HON. Treasurer**  
M.A.C.S.

**HON. Secretary**  
M.A.C.S.

**Nikhil Gugale**  
Partner  
M. NO. 177609

Place: Pune  
Date: 27-Jun-2022

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

**STATEMENT OF RECEIPTS & PAYMENTS FOR THE YEAR ENDED ON 31.03.2022**

Amount - Rs.

RECEIPTS	SCH.	CURRENT YEAR	PREVIOUS YEAR	PAYMENTS	SCH.	CURRENT YEAR	PREVIOUS YEAR
Opening Balances	F	5,77,817	13,57,660	Establishment Expenses	H	2,04,348	1,94,955
Interest Received				Expenditure on Object of Trust	K	60,000	5,000
On Savings Bank A/c		74,820	99,824	Audit Fees & Creditors		85,915	5,62,621
Interest on Investments		7,93,338	1,17,049	Income tax refund paid share of ARI & Scheme		14,31,798	-
Encashment of Fixed Deposit		31,00,000	7,00,000	Legal Fees		-	-
Income tax refund received with interest		4,675	-	Professional fees		-	-
<b>Donation Received</b>				Fixed Deposit with Banks		31,00,000	8,79,640
C.M. Relief Fund		-	-	Indirect Receipt & Payment	J	6,67,35,000	29,57,10,892
Income from Other Sources	G	1,86,500	500	Closing Balances	F	13,26,561	5,77,817
Indirect Receipt & Payment	J	6,82,06,472	29,56,55,892				
<b>TOTAL</b>		<b>7,29,43,622</b>	<b>29,79,30,925</b>	<b>TOTAL</b>		<b>7,29,43,622</b>	<b>29,79,30,925</b>

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

As per our report of even date  
For **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**HON. F.& A.O.**  
M.A.C.S.

**HON. Treasurer**  
M.A.C.S.

**HON. Secretary**  
M.A.C.S.

**Nikhil Gugale**  
Partner  
M. NO. 177609

Place: Pune  
Date: 27-Jun-2022

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

**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
<b>TOTAL(RS.)</b>		<b>1,07,61,721</b>	<b>1,07,61,721</b>

**Schedule "B" : Current Liabilities**

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
OTHER LIABILITIES	3	34,48,427	37,72,987
<b>TOTAL(RS.)</b>		<b>34,48,427</b>	<b>37,72,987</b>

**Schedule "C" : Fixed Assets**

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
IMMOVABLE PROPERTIES	5	91,23,514	91,26,479
FURNITURE AND DEAD STOCK	6	80,148	1,24,453
<b>TOTAL(RS.)</b>		<b>92,03,662</b>	<b>92,50,932</b>

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE-411 004  
Schedules to and forming part of Balance Sheet as on 31.03.2022

**Schedule "D" : Investments**

Amount - Rs.

Sr. No.	Name of the Company	PARTICULARS	Date of Investment	Date of Maturity	CURRENT YEAR	PREVIOUS YEAR
<b>SHARES</b>					1325	1325
1	Central Potteries Ltd. Nagpur	Share of Rs. 25 each Certificate No.1343 bearing Sr.No. 29114 to 29126 13 ordinary Certificate No. 551 bearing Sr.No. 3717 to 3756 40 ordinary	21.01.1949 10.06.1940			
2	HINDUSTAN MOTORS LTD.	Shares of Rs. 10 each 50 ordinary Share certificate No.33932 bearing Sr. No.4632651-4632700	-	-	500	500
<b>FIXED DEPOSITS</b>						
1	BANK OF MAHARASHTRA	60088467793 60088467534	30.12.2020 30.12.2020	31.12.2023 31.12.2023	3,00,000 3,00,000	3,00,000 3,00,000
2	INDIAN BANK	6019228988 6019228671 6056528884	03.03.2021 03.03.2021 31.07.2021	29.02.2024 29.02.2024 28.07.2024	10,32,625 10,32,625 2,00,000	10,32,625 10,32,625 2,00,000
4	BANK OF INDIA	50345110007246	24.11.2020	24.11.2022	19,56,108	19,56,108
5	HDFC	50300352429665 50300600778898 50300600781152 50300600779810 50300405767617 50300405767962 50300417029245 50300437838952 50300417031045	10.07.2021 04.03.2022 04.03.2022 04.03.2022 25.02.2022 25.02.2022 08.04.2020 12.06.2020 08.04.2020	11.07.2022 05.03.2024 05.03.2024 05.03.2024 26.02.2024 26.02.2024 09.04.2022 13.06.2022 09.04.2022	71,47,178 10,00,000 17,00,000 4,00,000 5,00,000 10,00,000 2,00,000 5,69,640 1,10,000	67,83,435 10,00,000 17,00,000 4,00,000 5,00,000 10,00,000 2,00,000 5,69,640 1,10,000
6	IDFC	10053500553	12.07.2021	24.11.2022	10,00,000	11,07,178
<b>GRAND TOTAL</b>					<b>1,84,50,001</b>	<b>1,81,93,436</b>

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

Schedule to and forming part of Balance Sheet as on 31.03.2022

**Schedule "E" : Deposits & Advances**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>DEPOSITS :</b>				
Telephone Deposit	10,000		10,000	
Deposit with Court	15,000	25,000	15,000	25,000
<b>ADVANCES :</b>				
Advance to Staff	-			
Income Tax Deducted at Source	34,92,055	34,92,055	35,65,573	35,65,573
<b>Interest accrued on Investments</b>				
(Subject to confirmation from bank & other agencies)				
As per last Balance Sheet	2,41,055		2,50,532	
Less Realised during the year	4,15,558		1,84,314	
	(1,74,503)		66,218	
Accrued Interest during the year	2,00,322	25,819	1,74,837	2,41,055
<b>TOTAL Rs.</b>		<b>35,42,874</b>		<b>38,31,628</b>

**Schedule "F" : Cash & Bank Balances**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	OPENING BALANCE	CLOSING BALANCE	OPENING BALANCE	CLOSING BALANCE
<b>CASH IN HAND</b>	4,798	7,727	10,647	4,798
<b>BANK :-</b>				
With Bank of Maharashtra	2,71,624	1,51,907	10,14,710	2,71,624
Erandwana Branch in Savings A/c No.9709				
With Union Bank of India, F.C.Road Branch in S.B.A/c 48941261091951	3,00,850	3,98,182	2,20,446	3,00,850
With HDFC SAVING BK A/C NO.50100304122670	545	7,68,745	1,11,857	545
<b>TOTAL (RS.)</b>	<b>5,77,817</b>	<b>13,26,561</b>	<b>13,57,660</b>	<b>5,77,817</b>

## 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 31.03.2021

**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
Fee for Home Gardening course	-	-		
Claim received against loss due to flood	-	-		
Life Membership Fees		500	500	500
<b>TOTAL (RS.)</b>	<b>-</b>	<b>500</b>	<b>500</b>	<b>500</b>

**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	1,79,046	1,79,046	1,74,422	1,74,422
Meeting Expenses	6,431	6,431	5,849	5,849
Travelling & Conveyance			3,150	3,150
Printing & Stationery	295		3,361	2,520
Professional Fees	10,000	10,000		
Advertisement charges	9,450	9,450	7,875	7,875
Bank charges	443	443	1,139	1,139
<b>TOTAL (RS.)</b>	<b>2,05,665</b>	<b>2,05,370</b>	<b>1,95,796</b>	<b>1,94,955</b>

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004  
Schedules forming part of Income & Expenditure Account for the year ended on 31.03.2022

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

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
<b>Expenditure out of Earmarked Donations</b>		
Prof. V.P. Gokhale Award Expenses	-	-
Dr. R.B. Ekbote Award Expenses	-	-
Dr. A.D. Agate Award Expenses	-	2,500
Donation Expenses Prof. P.V. Sukhatme	-	2,500
Prof. S.P. Agharkar Chair Expenses	-	5,50,000
Home Garden Course Expenses	75,891	-
Smt. Parvatibai Agharkar Fellowship Award	-	-
<b>TOTAL (RS.)</b>	<b>75,891</b>	<b>5,55,000</b>

Schedules forming part of Receipt & Payment Account for the year ended on 31.03.2022

### Schedule "J" : Indirect Receipts & Payments

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	RECEIPTS	PAYMENTS	RECEIPTS	PAYMENTS
ARI Account	6,55,00,000	6,55,00,000	29,50,00,000	29,50,00,000
Schemes Account	12,00,000	12,00,000	6,48,892	6,48,892
Advance to staff	22,087	35,000	7,000	2,000
TDS Professional fees & Contractor	-	-	-	60,000
Loans and advances	13,54,094	-	-	-
Current Liabilities	1,30,291	-	-	-
Testing fees (Smartchem Tech)	-	-	-	-
<b>TOTAL (RS.)</b>	<b>6,82,06,472</b>	<b>6,67,35,000</b>	<b>29,56,55,892</b>	<b>29,57,10,892</b>

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004  
Schedules to and forming part of Receipts & Payments for the year ended on 31.03.2022

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

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
<b>Expenditure out of Earmarked Donations</b>		
Prof. V.P. Gokhale Award Expenses	-	-
Dr. R.B. Ekbote Award Expenses	5,000	-
Dr. A.D. Agate Award Expenses	2,500	2,500
Yogamaya Award Expenses	50,000	-
Donation Expenses Prof. P.V. Sukhatme	2,500	2,500
Prof. S.P. Agharkar Chair Expenses	-	-
Home Garden Course Expenses	-	-
Smt. Parvatibai Agharkar fellowship award	-	-
<b>TOTAL (RS.)</b>	<b>60,000</b>	<b>5,000</b>

### Schedule "L" : Income From Other Sources

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Fee for Home Gardening Course	1,80,000	-
Laboratory Charges	2,70,992	-
Life Membership Fees	500	500
<b>TOTAL (RS.)</b>	<b>4,51,492</b>	<b>500</b>

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004  
Schedules to and forming part of Balance Sheet as on 31.03.2022

**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
<b>TOTAL (RS.)</b>	<b>1,03,77,874</b>	<b>1,03,77,874</b>

**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
<b>TOTAL (RS.)</b>	<b>3,83,847</b>	<b>3,83,847</b>

**Sub Schedule "3" Other Liabilities**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Audit fees payable	-	3,540
Medclin Research Pvt. Ltd	-	2,70,992
TDS Payable	34,48,427	34,98,455
Sundry Creditors	-	-
<b>TOTAL (RS.)</b>	<b>34,48,427</b>	<b>37,72,987</b>

**Sub Schedule "4" Income & Expenditure Account**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Opening Balance	1,73,19,104	1,69,65,088
Surplus carried over to Balance sheet	9,93,845	3,54,016
	1,83,12,949	1,73,19,104
<b>TOTAL (RS.)</b>	<b>1,83,12,949</b>	<b>1,73,19,104</b>

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

Schedule to and forming part of Balance Sheet as on 31.03.2022

**Sub Schedule "5" : Immovable Properties**

Amount - Rs.

SR No	Particulars	Rate of Depreciation	GROSS BLOCK		DEPRECIATION BLOCK			WDV as on 31.03.2022		
			Cost as on 01.04.21	Additions during the year	Total Cost as on 31.03.2022	Up to 31.3.2021	Dep. On opening Balance		Dep. On the Additions during the year	Total Dep. for the Year
1	Land at Pune		96,500	-	96,500	-	-	-	-	96,500
2	Land at Songaon		88,19,437	-	88,19,437	-	-	-	-	88,19,437
3	Land Development Expenses at Hol		2,02,583	-	2,02,583	-	-	-	-	2,02,583
4	Biometry Building	2.50%	1,15,200	-	1,15,200	1,07,389	2,880	2,880	1,10,269	4,931
5	Microbiology Building	2.50%	3,389	-	3,389	3,241	85	85	3,326	63
	<b>TOTAL (RS.)</b>		<b>92,37,109</b>	<b>-</b>	<b>92,37,109</b>	<b>1,10,630</b>	<b>2,965</b>	<b>2,965</b>	<b>1,13,595</b>	<b>91,23,514</b>

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

Schedule to and forming part of Balance Sheet as on 31.03.2022

**Sub Schedule "6" : Furniture and Dead Stock**

Amount - Rs.

PARTICULARS	GROSS BLOCK			DEPRECIATION BLOCK							WDV as on 31.03.2022
	Cost as on 1.4.2021	Additions during the year 31.03.2022	Total cost as on 31.03.2022	Rate of Depreciation	Up to 31.3.2021	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	Total as on 31.03.2022		
1	2	3	4	5	6	7	8	9	10	11	
<b>A)(I) GENERAL</b>											
1. Office Equipment's & Furniture & Sports Items	6,18,987	-	6,18,987	10%	6,05,756	13,230	-	13,230	6,18,986	1	
2. Apparatus & Equipment's	3,15,076	-	3,15,076	20%	2,89,836	25,239	-	25,239	3,15,075	1	
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	3,079	-	3,079	1,19,521	1	
5. Y -Type System for Grapes-Hol	1,10,497	-	1,10,497	10%	1,10,496	-	-	-	1,10,496	1	
6. Construction of Statue	98,090	-	98,090	2.5%	19,616	2,452	-	2,452	22,068	76,022	
<b>SUB TOTAL (A) (I)</b>	<b>12,72,042</b>	<b>-</b>	<b>12,72,042</b>		<b>11,52,015</b>	<b>44,000</b>	<b>-</b>	<b>44,000</b>	<b>11,96,015</b>	<b>76,027</b>	
<b>A)(II) SPECIAL PUBLICATIONS</b>											
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	
<b>SUB-TOTAL (A) (II)</b>	<b>7,582</b>	<b>-</b>	<b>7,582</b>	<b>0%</b>	<b>3,467</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3,467</b>	<b>4,115</b>	
<b>TOTAL A (I+II)</b>	<b>12,79,624</b>	<b>-</b>	<b>12,79,624</b>	<b>0%</b>	<b>11,55,482</b>	<b>44,000</b>	<b>-</b>	<b>44,000</b>	<b>11,99,482</b>	<b>80,142</b>	

Amount - Rs.

PARTICULARS	GROSS BLOCK			DEPRECIATION BLOCK							WDV as on 31.03.2022
	Cost as on 1.4.2021	Additions during the year 31.03.2022	Total cost as on 31.03.2022	Rate of Depreciation	Up to 31.3.2021	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	Total as on 31.03.2022		
1	2	3	4	5	6	7	8	9	10	11	
<b>B) UNIVERSITY OF PUNE</b>											
1. Office Equipment & Furniture	1,300	-	1,300	0%	1,242	57	-	57	1,299	1	
2. Books	25,538	-	25,538	0%	25,341	196	-	196	25,537	1	
3. Apparatus & Equipments	9,914	-	9,914	0%	9,891	22	-	22	9,913	1	
<b>TOTAL (B)</b>	<b>36,752</b>	<b>-</b>	<b>36,752</b>	<b>0%</b>	<b>36,474</b>	<b>275</b>	<b>-</b>	<b>275</b>	<b>36,749</b>	<b>3</b>	
<b>C) GOVT. OF MAHARASHTRA</b>											
1. Office Equipment & Furniture	1,008	-	1,008	10%	993	14	-	14	1,007	1	
2. Apparatus & Equipments	21,363	-	21,363	20%	21,345	17	-	17	21,362	1	
3. Books	1,210	-	1,210	20%	1,209	-	-	-	1,209	1	
<b>TOTAL (C)</b>	<b>23,581</b>	<b>-</b>	<b>23,581</b>		<b>23,547</b>	<b>31</b>	<b>-</b>	<b>31</b>	<b>23,578</b>	<b>3</b>	
<b>GRAND TOTAL (A+B+C)</b>	<b>13,39,957</b>	<b>-</b>	<b>13,39,957</b>		<b>12,15,503</b>	<b>44,306</b>	<b>-</b>	<b>44,306</b>	<b>12,59,809</b>	<b>80,148</b>	

# 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<sup>st</sup> March, 2022 and Income and Expenditure Account for the year ended on that date annexed to. "There is no serious irregularities appear to be observed by the Auditor while auditing the annual accounts in the Annual Report 2021-22 as per Auditors observation/Report".

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. Fixed Assets and Closing Stock as on 31<sup>st</sup> March, 2022 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.
2. Long outstanding balances are appearing under current liabilities to various accounts. However, no reconciliation; confirmations were made available for our verification. Impact of the same on Income & Expenditure could not be ascertained due to non-availability of information/ documents.
3. Old unreconciled balances are appearing under Current Assets; Loans & Advances. However, no reconciliation; confirmations were made available for our verification. Impact of the same on Income & Expenditure could not be ascertained due to non-availability of information/ documents.

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 31<sup>st</sup>, March 2022.
  - 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.
6. There is no separate Corpus Fund created by the institute. The balance of Income Expenditure i.e Surplus/Deficit is transferred to Corpus/Capital Fund Schedule.

As per our report of even date  
For **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

Place: Pune  
Date: 27-Jun-2022

**Nikhil Gugale**  
Partner  
M. NO. 177609

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

**Balance Sheet as on 31.03.2022**

Amount - Rs.

PARTICULARS	SCH	CURRENT YEAR	PREVIOUS YEAR
<b>CORPUS/CAPITAL FUND AND LIABILITIES:</b>			
CAPITAL FUND	1	18,18,07,131	8,86,00,123
RESERVES AND SURPLUS	2	-	-
EARMARKED/ENDOWMENT FUNDS	3	19,21,22,480	18,15,41,572
SECURED LOANS AND BORROWINGS	4	-	-
UNSECURED LOANS AND BORROWINGS	5	-	-
DEFERRED CREDIT LIABILITIES	6	-	-
CURRENT LIABILITIES AND PROVISIONS	7	22,18,84,903	22,80,13,671
<b>TOTAL</b>		<b>59,58,14,514</b>	<b>49,81,55,366</b>
<b>ASSETS:</b>			
FIXED ASSETS	8	21,84,05,138	20,58,59,651
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	9,68,42,831	10,34,92,360
INVESTMENTS-OTHERS	10	-	-
CURRENT ASSETS, LOANS, ADVANCES ETC.	11	28,05,66,545	18,88,03,355
MISCELLANEOUS EXPENDITURES (to the extent not written off or adjusted)			
<b>TOTAL</b>		<b>59,58,14,514</b>	<b>49,81,55,366</b>
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

**(D.K. SHARMA)**FINANCE & ACCOUNTS OFFICER  
MACS-ARI

Place: Pune

Date: 27-Jun-2022

**(P.K. DHAKEPHALKAR)**DIRECTOR  
MACS-ARI

As per our report of even date  
For **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**Nikhil Gugale**

Partner

M. NO. 177609

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

**Income & Expenditure Account for the Year ended 31.03.2022**

Amount - Rs.

PARTICULARS	SCH	CURRENT YEAR	PREVIOUS YEAR
<b>Income</b>			
Income from Sales/Services	12	17,99,327	17,00,338
Grants/Subsidies	13	21,18,76,200	25,18,26,895
Fees/Subscriptions	14	1,82,940	2,61,920
Income from Investments(Income on Invest. From earmarked/endowment Funds transferred to Funds)	15	-	-
Income from Royalty, Publications etc.	16	60,296	-
Interest Earned	17	15,20,119	11,79,688
Other Income	18	1,85,847	9,02,032
Increase/(decrease) in stock of Laboratory consumables	19	5,59,342	(23,679)
Donation Received in kind (Equipment)		-	-
<b>Total (A)</b>		<b>21,61,84,070</b>	<b>25,58,47,194</b>
<b>Expenditure</b>			
Establishment Expenses	20	15,86,62,953	24,09,14,164
Other Administrative Expenses etc.	21	4,45,59,517	3,64,65,727
Expenditure on Grants, Subsidies etc.	22	-	-
Interest	23	-	-
Depreciation (Net Total at the year-end- corresponding to schedule 8)	8	2,53,79,600	1,13,25,137
<b>Total (B)</b>		<b>22,86,02,070</b>	<b>28,87,05,028</b>
Balance being excess of Expenditure over Income (A-B)		(1,24,18,000)	(3,28,57,834)
<b>CORPUS/CAPITAL FUND</b>		<b>(1,24,18,000)</b>	<b>(3,28,57,834)</b>
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 **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**(D.K. SHARMA)**  
FINANCE & ACCOUNTS OFFICER  
MACS-ARI  
Place: Pune  
Date: 27-Jun-2022

**(P.K. DHAKEPHALKAR)**  
DIRECTOR  
MACS-ARI

**Nikhil Gugale**  
Partner  
M. NO. 177609

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

Schedules Forming Part of Balance Sheet as at 31.03.2022

**Schedule 1: Corpus/Capital Fund**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>Corpus Fund</b>	-		-	
<b>Capital Fund</b>				
Balance as the beginning of the year	6,21,55,441		6,10,53,316	
Add : Contributions towards Corpus/ Capital Fund (Schedule D)	3,81,25,780		3,39,59,959	
Add/ (Deduct) : Balance of Net Income/ (Expenditure)	(1,24,18,000)	8,78,63,221	(3,28,57,834)	6,21,55,441
<b>Capital Grant</b>				
Balance as the beginning of the year	2,64,44,682		3,50,26,047	
Add: Capital Grant during the year	10,50,00,000		2,50,00,000	
Add: Interest Earned F.Y 2021-22 (Cap)	12,59,686		6,34,678	
Less: Interest Paid F.Y 2020-21 (Cap)	6,34,678		2,56,084	
Less: Expenditure during the year	3,81,25,780		3,39,59,959	
		9,39,43,910		2,64,44,682
<b>Balance at the end of the year</b>		<b>18,18,07,131</b>		<b>8,86,00,123</b>

**Schedule 2: Reserves & Surplus**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>1. Capital Reserve:-</b>				
As per last Account	-		-	
Addition during the year	-		-	
Less: Transfer to Establishment expenses	-	-	-	-
<b>2. Revaluation Reserve:-</b>				
As per last Account	-		-	
Addition during the year	-		-	
Less: Deductions during the year	-	-	-	-
<b>3. Special Reserve : A.R.I. Reserve Fund:-</b>				
As per last Account	-		-	
Addition during the year	-		-	
Add: Interest accrued	-		-	
Less: Deductions during the year	-	-	-	-
<b>4. General Reserve:-</b>				
As per last Account	-		-	
Addition during the year	-		-	
Less: Deductions during the year	-	-	-	-
<b>Total (Rs.)</b>				

\* Interest earned on capital payable to DST

\*\* There is no separate **Corpus Fund created by the institute**. The balance of Income Expenditure i.e Surplus/Deficit & Equipment Purchase During the year is transferred to Capital Fund Schedule.

**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
<b>a&gt; Opening balance of the funds</b>	11,71,91,013	7,28,731	2,060	1,26,939	11,80,48,743	10,14,76,419
<b>b&gt; Additions to the funds:</b>	-	-	-	-	-	-
i) Donations/grants	-	-	-	-	-	-
ii) Income from investments made on account of funds.	89,82,935	14,394	-	-	89,97,329	53,50,335
iii) Culture Identification Charges	-	-	-	-	-	-
iv) Overhead Charges from Scheme	25,42,546	-	-	-	25,42,546	37,10,420
v) Interest received on Funds from various projects	-	-	-	-	-	-
vi) Other Misc.	40,77,739	-	-	-	40,77,739	83,78,913
<b>TOTAL (a+b)</b>	<b>13,27,94,233</b>	<b>7,43,125</b>	<b>2,060</b>	<b>1,26,939</b>	<b>13,36,66,357</b>	<b>11,89,16,087</b>
<b>c&gt;Utilisation/Expenditure towards objectives of funds</b>	-	-	-	-	-	-
<b>i&gt; Capital Expenditure</b>	-	-	-	-	-	-
Fixed Assets	-	-	-	-	-	-
Others	-	-	-	-	-	-
<b>ii&gt; Revenue Expenditure</b>	-	-	-	-	-	-
Salaries, Wages and allowances etc.	-	-	-	-	-	-
Rent	-	-	-	-	-	-
Other Administrative Expense	-	-	-	-	-	8,67,344
<b>TOTAL (c)</b>	-	-	-	-	-	<b>8,67,344</b>
<b>NET BALANCE AS AT THE YEAR-END (a+b-c)</b>	<b>13,27,94,233</b>	<b>7,43,125</b>	<b>2,060</b>	<b>1,26,939</b>	<b>13,36,66,357</b>	<b>11,80,48,743</b>
Add: Balance as per Schedule 3A	-	-	-	-	5,84,56,123	6,34,92,829
<b>Total Balance as on 31.3.2021</b>	<b>13,27,94,233</b>	<b>7,43,125.00</b>	<b>2,060.00</b>	<b>1,26,939.00</b>	<b>19,21,22,480</b>	<b>18,15,41,572</b>

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004  
Schedules Forming Part of Balance Sheet as at 31.03.2022

**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	S/APL/SP-303- Dr. S.K.Singh		8,37,110	4,97,648	5,96,202		9,35,664
2	S/ARP ENVIRONMENT		7,892				7,892
3	S/Biome Tech/SP-308- Mr. P.R. Kshirsagar		50,261	29,424			20,837
4	S/BMGF & DFID/SP-326- Dr. Yashavanthakumar		-		7,45,139		7,45,139
5	S/CSIR/ LEATHER ADDITIONAL COMP	800				800	-
6	S/CSIR/SP 271-Dr. Yogesh Karpe		6,116	6,116			-
7	S/CSIR/SP 272- Dr. K.G. Kulkarni	6,245		51,999	58,244		-
8	S/DBT/ SP 185	1,71,438				1,71,438	-
9	S/DBT/SP 188- Dr. Ghaskadbi	2,41,502				2,41,502	-
10	S/ DBT/ SP 189-Dr. Ghaskadbi		17,479				17,479
11	S/DBT/ SP 199	60,303				60,303	-
12	S/DBT/SP 207-Dr. Behera		9,75,700				9,75,700
13	S/DBT/ SP 234- Dr. Paknikar/Dr. Ghormade		2,20,459	2,70,459	50,000		-
14	S/DBT/ SP 238-Dr. Manoj Oak		1,00,021				1,00,021
15	S/DBT/ SP 250- Dr. Varghese		40,025				40,025
16	S/DBT/SP 256-Dr. Shrivage		89,734	89,443			291
17	S/DBT/SP- 270- Dr. Yogesh Karpe		2,00,935				2,00,935
18	S/DBT/SP 276-Dr. Sumit Dagar		5,40,217	5,45,429	5,212		-
19	S/DBT/SP-278-Dr. Shrivage		1,15,137	1,15,392	255		-
20	S/DBT/SP 280-- Dr. Ratnaparkhi		7,27,720	5,48,984	6,410		1,85,146
21	S/DBT/ SP 281-Dr. Tamhankar		3,30,377	76,925	7,628		2,61,080
22	S/DBT/ SP 282- Dr. Karthick B.		2,53,975	6,63,227	2,19,630	1,89,622	
23	S/DBT/SP-293- Dr. S.A. Tamhankar		27,08,370	26,87,660	3,99,025		4,19,735
24	S/DBT/SP-297-Dr. Chinmoy Patra	3,00,087		13,59,073	12,03,901	4,55,259	-
25	S/DBT/SP-300 - Dr. J.M. Rajwade		10,56,885	12,17,719	10,64,405		9,03,571
26	S/DBT/SP-310- Dr. Yashavanthakumar		12,908	15,38,522	23,46,382		8,20,769
27	S/DBT/SP-323 - Dr. Vandana Ghormade		10,67,218	4,15,630	4,76,044		11,27,632
28	S/DBT/SP-327 - Dr. Vandana Ghormade		-	1,73,110	25,90,686		24,17,576
29	S/DBT/ SP 70		242				242
30	S/DBT/ WHEAT MOLECULAR SEMINAR		976				976
31	S/DST/ ANAEMIA WORKSHOP		91,595				91,595
32	S/DST/ GLV MEETING		11,845				11,845
33	S/ DST/ SP 255- Dr. Rajwade		2,44,755	2,44,755			-

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
34	S/DST/ SP 261- Dr. Gajbhiye		58,737				58,737
35	S/DST/SP 263- Dr. Yogesh Karpe		55,574				55,574
36	S/DST/SP-274- Dr. Karthick		1,98,379	2,05,491	7,112		-
37	S/DST/SP-285- Ms Pranitha Pandit	3,64,690		3,31,461	7,01,715		5,564
38	S/DST/SP-301- Dr. Ritu Mamgain		5,46,118	5,49,306	3,188		-
39	S/DST/SP-315- Dr. Garima Mishra		8,57,674	11,69,542	12,77,386		9,65,518
40	S/DST/SP-336 - Dr. Yogesh Karpe		-		9,77,070		9,77,070
41	S/ DST WOS-B/ SP 152	3,19,195		559	9,522	3,10,232	
42	S/DY Patil Dental College/SP- 324 - Dr. J.M. Rajwade		1,50,000	25,000			1,25,000
43	S/DYPatil/SP 273 New D.Y. Patil		12,877				12,877
44	S/GCP/SP 166	33,379				33,379	
45	S/GCP WORKSHOP		2,26,032				2,26,032
46	S/HTBSIL/ SP 243		2,47,542	67,312			1,80,230
47	S/HTBS/SP-321 - Dr. P.K. Dhakephalkar		3,50,000	5,84,417	9,50,000		7,15,583
48	S/ICAR-NASF/SP-319- Dr. R.M. Patil		1,70,789	34,17,154	36,39,292		3,92,927
49	S/ICAR/SOYBEAN WORKSHOP		15,634				15,634
50	S/ICAR/ SOY CONTRACT SCH		5,872				5,872
51	S/ICAR/SP 001		31,88,910	26,14,739	16,45,000		22,19,171
52	S/ICAR/SP 002		8,24,436	42,21,654	38,75,544		4,78,326
53	S/ICAR/SP 003		4,83,649	88,29,166	84,89,275		1,43,758
54	S/ICAR/SP 033		76,21,160	33,227	5,47,722		81,35,655
55	S/ICAR/SP 034		1,030	40,080	39,470		420
56	S/ICAR/SP 043		50,110				50,110
57	S/ICAR/SP 096		60,68,264	9,60,683	13,55,800		64,63,381
58	S/ICAR/SP 183		8,457				8,457
59	S/ICAR/SP 211		4,24,762				4,24,762
60	S/ICAR/SP-296 - Dr. Philips Varghese		5,58,000				5,58,000
61	S/ICAR/WHEAT TRIAL		125				125
62	S/ICMR/SP-299 - Dr. Dhananjay Bodas		9,27,767	8,87,156	4,79,158		5,19,769
63	S/ICMR/SP-325 - Dr. Virendra Gajbhiye		-	10,09,518	26,45,176		16,35,658
64	S/ICMR/SP-335 - Dr. Vandana Ghormade		-	33,338	11,47,413		11,14,075
65	S/IndiaAlliance DBT Wellcome/ SP-302 - Dr. Patra		1,31,16,540	63,36,127	2,59,190		70,39,603
66	S/INDO SWISS BIOTECHNOLOGY	10,014				10,014	
67	S/INDO-US BIOREMEDIATION	818				818	
68	S/ISRO/SP-258	21,511				21,511	

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
69	S/KPIT/SP-289 - Dr. P.K. Dhakephalkar		2,77,981	2,74,689	12,00,000		12,03,292
70	S/LSRB/SP 145		1,204				1,204
71	S/MAX PLANCK/SP 239		70,475	59,099			11,376
72	S/MOEF/SP-279- Dr. Karthick	76,989				76,989	
73	S/MoES/SP 266		2,24,976	3,21,100	1,486	94,638	
74	S/MoES/SP-298 - Dr. Tushar Kaushik	95,153		7,84,923	8,34,491	45,585	
75	S/NBPL/SP-312 - Dr. S.K. Singh		1,66,763	2,07,674	2,54,238		2,13,327
76	S/OECT/SP-313 - Dr. P.K. Dhakephalkar		15,14,482	19,31,888	11,85,318		7,67,912
77	S/Pitambari Products Pvt Ltd/SP 269		12,475				12,475
78	S/RGSTC/SP 168- Dr. Upadhye		19,442				19,442
79	S/RGSTC/SP-283 Dr. Bharati Sharma		6,52,067	5,44,121	70,164		1,78,110
80	S/RGSTC/SP-314- Dr. P.P. Kulkarni		11,06,988	12,26,311	10,60,500		9,41,177
81	S/SERB/SP 220- Dr. Gargee Pandit		31,957				31,957
82	S/SERB/SP 251- Dr. A. Ratnaparkhi		1,66,680				1,66,680
83	S/SERB/ SP 252- Dr. Karthick Balsubramanian		12,616				12,616
84	S/SERB/SP 253- Dr. Rajesh Kumar K C		51,755	51,755			-
85	S/SERB/SP 254 - Dr. Vikram Lanjekar		41,155	41,155			-
86	S/SERB/ SP 257- Dr. Bodas		3,55,120				3,55,120
87	S/SERB/ SP 259 - Dr. Chinmoy Patra		3,262				3,262
88	S/SERB/SP-264-Dr. R.M. Patil		44,715	44,715			-
89	S/SERB/SP 265- Dr. Mandar Datar		87,287				87,287
90	S/SERB/SP-286- Dr. Monali Rahalkar		6,14,863	6,22,121	7,258		-
91	S/SERB/SP 287- Dr. Vandana Ghormade		2,77,584	9,69,710	7,05,462		13,336
92	S/SERB/SP 288 - Dr. Prasad Kulkarni		2,91,609	6,85,146	5,11,738		1,18,201
93	S/SERB/SP 290 - Dr. Virendra Gajbhiye		36,974	36,974			-
94	S/SERB/SP 291- Dr. Abhishek Baghela		81,480	8,57,237	10,09,858		2,34,101
95	S/SERB/SP 292- Dr. S.A. Tamhankar		1,28,335	7,34,081	10,08,540		4,02,794
96	S/SERB/SP 294-Dr. Sujata Tetali		7,06,133	9,07,592	4,16,062		2,14,603

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
97	S/SERB/SP-295- Dr. Madhuri Pawar		1,56,492	5,75,712	4,12,557	6,663	-
98	S/SERB/SP-304 - Dr. Bothiraja & Dr. J.M. Rajwade		2,62,489	2,34,745	5,903		33,647
99	S/SERB/SP-305 - Dr. Mahesh Borde & Dr. S.K. Singh		35,357	1,84,931	3,28,761		1,79,187
100	S/SERB/SP-306 - Dr. Himanshu		8,52,632	10,81,962	4,19,602		1,90,272
101	S/SERB/SP-307-Dr. Kriti Sengupta		8,18,758	7,85,501	3,52,088		3,85,345
102	S/SERB/SP-309 - Dr. Anuradha Ratnaparkhi		7,99,069	7,61,747	7,14,026		7,51,348
103	S/SERB/SP-311 Dr. Gajbhiye & Dr. Karpe		8,81,290	8,89,475	8,185		-
104	S/SERB/SP-316 - Dr. Rajesh Kumar K.C.		8,68,359	7,94,222	17,231		91,368
105	S/SERB/SP-317 - Dr. R.K. Choudhary		9,31,110	11,76,605	4,48,160		2,02,665
106	S/SERB/SP-318-Dr. B.V. Shrivage		25,16,411	19,17,321	46,307		6,45,397
107	S/SERB/SP-320-Dr. Yogesh Karpe		11,52,664	11,68,453	10,12,225		9,96,436
108	S/SERB/SP-322 - Dr. Jyotsna Asthana		8,62,985	10,88,499	9,391	2,16,123	-
109	S/SERB/SP-328 - Dr. Karthick Balasubramanian		-	2,40,470	11,65,164		9,24,694
110	S/SERB/SP-330 - Dr. Monali Rahalkar		-	78,126	7,56,534		6,78,408
111	S/SERB/SP-33-Dr. Tushar Kaushik		-	1,62,150	13,77,004		12,14,854
112	S/SERB/SP-332 - Dr. S.P. Navathe		-	3,02,179	20,38,619		17,36,440
113	S/SERB-TARE/SP-329 - Dr. Vinodkumar Ugale		-	25,000	3,36,972		3,11,972
114	S/SERB-TARE/SP-333- Dr. Hiralal Bhaskar Sonawane		-	25,000	3,36,147		3,11,147
115	S/SERB-TARE/SP-334 - Dr. Girish Pendharkar		-	25,000	3,36,124		3,11,124
116	S/ SP 171-B		72,149				72,149
117	S/Tata/SP-268- Dr. M. N. Datar		4,11,890	72,797	-		3,39,093
118	Vishwadeep Pressparts Pvt Ltd.		3,52,185				3,52,185
119	CSIR ALL SCHEMES		78,608				78,608
120	F/CSIR/Ajay Lagashetti		3	30,003	40,000		10,000
121	F/CSIR/ANAGHA BASARGEKAR		3,398				3,398
122	F/CSIR/Ansil P A			19,658	20,000		342
123	F/CSIR/Bhagyashri Joshi			10,981	23,393		12,412
124	F/CSIR/CONSOLIDATED		2,72,122				2,72,122
125	F/CSIR/Darshetkar Ashwini		890		20,000		20,890
126	F/CSIR/Deshpande Payal		20,000		40,000		60,000
127	F/CSIR/Dr. Ghaskadbi Csir		12,014	3,80,690	3,71,244		2,568
128	F/CSIR/Gaikwad Ramesh		20,000				20,000
129	F/CSIR/Gulshan Walke		403				403
130	F/CSIR/Jyothish S				47,753		47,753

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT
131	F/CSIR/Komal Suryavanshi			50,624	51,403		779
132	F/CSIR/Kumal Kaatri		3,279		26,685		29,964
133	F/CSIR/Malika Suthar				35,068		35,068
134	F/CSIR/Mrunmayee Kulkarni			17,655	20,000		2,345
135	F/CSIR/Neelam Kapse		12,017				12,017
136	F/CSIR/Nidhi Murmu		1	3,214	3,311		98
137	F/CSIR/Nikhil Ashtekar			20,000	20,000		
138	F/CSIR/Nikita Mehta			18,209	20,000		1,791
139	F/CSIR/Patil Gokul		964	11,491	16,667		6,140
140	F/CSIR/Pooja Salunke		2,464	19,913	35,068		17,619
141	F/CSIR/ Prajakta Tambe		6,667				6,667
142	F/CSIR/Pravinkumar Methé		2,122	38,321	40,000		3,801
143	F/CSIR/ Rameshwar Avchar		371	18,221	20,000		2,150
144	F/CSIR/Saurabh Gaikwad		18,361		21,644		40,005
145	F/CSIR/Sayali Rohokale				20,000		20,000
146	F/CSIR/Smrithy Vijayan		14,667	17,064	9,986		7,589
147	F/CSIR/Snehal Jamalpure		3,061	8,549	28,434		22,946
148	F/CSIR/ Soham Pore		1,438				1,438
149	F/CSIR/ Sweta Malik		10				10
150	F/CSIR/Wadmara Neha		12,020	12,020	40,000		40,000
151	F/CSIR/Wagh Ganesh		19,071	18,863			208
152	F/DBT/DBT JRF Vikhe Parimal	2,40,248		5,23,410	8,26,200		62,542
153	F/DBT JRF/ Ameya Rayrikar	1,24,833			1,95,440		70,607
154	F/DBT/JRF - Niladri Haldar			2,00,880	2,13,945		13,065
155	F/DBT JRF/ Pramod Kumar	1,12,493				1,12,493	
156	F/DBT/JRF - Sachin Mapari	67,270		4,80,596	5,62,925		15,059
157	F/DBT/JRF - Snehal Kulkarni			3,71,587	3,95,753		24,166
158	F/DST INSPIRE/Aishwarya Padhye - JRF		2,50,640	5,71,043	5,98,985		2,78,582
159	F/DST INSPIRE/ Mayuri Shah		2,50,400				2,50,400
160	F/DST INSPIRE/ Pankuri K	23,558				23,558	
161	F/DST INSPIRE/Shradhha Rahi		51,605	5,23,854	4,95,636		23,387
162	F/DST INSPIRE/sonali Mundhe		3,46,628	3,34,180			12,448
163	F/DST-INSPIRE Faculty - Dr. Pratibha		-	1,25,000	22,00,000		20,75,000
164	Sonali Mundhe - DST Inspire Travel Grant				1,03,500		1,03,500
165	F/ICMR/ Gumaste U	42,498				42,498	
166	F/ICMR/kiran Nilangekar			5,20,800	5,40,800		20,000
167	F/ICMR/ Neha Kulkarni		2,596	1,30,200		1,27,604	
168	F/ICMR/ Nishikant Dixit	89,787				89,787	
169	F/ICMR/ Prabir Kumar		5,000				5,000
170	F/SRF/ICMR/Sulaxna Pandey		1,30,200	1,75,267	45,067		
171	UGC ALL SCH.		5,26,013				5,26,013
<b>SUB TOTAL</b>		<b>24,02,811</b>	<b>6,58,95,640</b>	<b>6,83,89,924</b>	<b>6,33,53,218</b>	<b>23,30,816</b>	<b>6,07,86,939</b>
<b>GRAND TOTAL</b>							<b>5,84,56,123</b>

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

Schedules Forming Part of Balance Sheet as at 31.03.2022

**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
<b>TOTAL Rs.</b>		<b>0.00</b>		<b>0.00</b>

Note: Amounts due within one year Nil

**Schedule 5: Unsecured Loans and Borrowings**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
1 Central Government		0.00		0.00
2 State Government (Specify)		0.00		0.00
3 Financial Institutions		0.00		0.00
4 Banks		0.00		0.00
a) Term Loans	0.00	0.00	0.00	0.00
b) Other Loans (Specify)	0.00	0.00	0.00	0.00
5 Other Institutions and Agencies		0.00		0.00
6 Debentures and Bonds		0.00		0.00
7 Fixed Deposits		0.00		0.00
8 Others (Specify)		0.00		0.00
<b>TOTAL Rs.</b>		<b>0.00</b>		<b>0.00</b>

**Schedule 6: Deferred Credit Liabilities**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
a) Acceptance secured by hypothecation of capital equipment and other assets	0.00	0.00	0.00	0.00
b) Others	0.00	0.00	0.00	0.00
<b>TOTAL Rs.</b>		<b>0.00</b>		<b>0.00</b>

Note: Amounts due within one year Nil

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

Schedules Forming Part of Balance Sheet as at 31.03.2022

**Schedule 7: Current Liabilities & Provisions**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>A. Current Liabilities :-</b>				
1. Acceptances	-		-	
2. Sundry Creditors:				
a) For Goods		5,70,323		2,97,999
3. Advances Received	-		-	
4. Interest Accrued but not due on:				
a) Secured Loans/borrowings	-		-	
b) Unsecured Loans/borrowings	-		-	
5. Statutory Liabilities:				
a) TDS Payable	12,91,509		11,24,322	
b) PF Commissioner A/c	3,15,631		3,14,481	
c) P.F. New Pension Scheme	85,761		88,991	
d) State Profession Tax	23,400	17,16,301	24,100	15,51,894
6. Other current Liabilities	1,48,07,100	1,48,07,100	1,87,78,040	1,87,78,040
7. Unspent Balance of Grant	3,08,83,079		2,29,02,026	
8. Earnest Money Deposit	76,000		7,07,297	
9. Security deposit	3,62,255		5,79,054	
10. Other Tuition Fees & University Share	37,940		1,12,309	
11. Recovery of Bank Loan	1,500		1,500	
12. Workshops Meetings etc.	16,58,851		20,07,856	
13. Interest Earned Payable to DST	-		-	
14. Retention Money	1,52,967	3,31,72,592	1,52,967	2,64,63,009
<b>Total (A)</b>		<b>5,02,66,317</b>		<b>4,70,90,943</b>
<b>B. PROVISIONS</b>				
1. For Taxation	-		-	
2. Gratuity	9,05,66,469		9,71,07,380	
3. Superannuation/Pension	-		-	
4. Accumulated Leave Encashment	7,03,87,889		7,47,29,118	
5. Trade Warranties/Claims	-		-	
6. Others				
- Salary payable for March	92,68,985		83,27,797	
- Audit fees	1,94,700		12,000	
- Electricity & Power	8,31,147		7,06,104	
- Postage & Telephone	31,696		35,659	
- Campus maintenance	4,216		4,670	
- Security Service Charges	1,42,956		-	
- Water Charges	1,60,775		-	
- Hired Labour Charges	29,753		-	
<b>Total (B)</b>		<b>17,16,18,586</b>		<b>18,09,22,728</b>
<b>Total (A+B)</b>		<b>22,18,84,903</b>		<b>22,80,13,671</b>

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004  
Schedules Forming Part of Balance Sheet as at 31.03.2022

**Schedule 8 : Fixed Assets**

Amount - Rs.

DESCRIPTION	GROSS BLOCK				DEPRECIATION				NET BLOCK				
	Cost/valuation on As at beginning of the year	Rate of Dep.	Deletions during the year	Net cost as on 31.3.2021	Additions during the year	Cost value at the year-end	As at the beginning of the year	Dep. on 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
<b>A FIXED ASSETS:</b>													
<b>1 LAND</b>													
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	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>2 BUILDINGS:</b>													
a> On Freehold	8,25,20,263	-	1,66,379	8,23,53,884	-	8,23,53,884	2,82,98,485	20,58,847	-	20,58,847	3,03,57,332	5,19,96,552	5,42,21,778
b> On Leasehold	-	-	-	-	-	-	-	-	-	-	-	-	-
c> Ownership Flats/Premises	-	-	-	-	-	-	-	-	-	-	-	-	-
d> Superstructures on Land and not belonging to the entity	-	-	-	-	-	-	-	-	-	-	-	-	-
e> Temporary Structures	23,33,896	2.5%	-	23,33,896	-	23,33,896	9,65,456	58,332	-	58,332	10,23,788	13,10,108	13,68,440
<b>3 PLANT MACHINERY &amp; EQUIPMENT</b>	33,26,02,359	10% / 20%	14,500	33,25,87,859	3,58,35,477	36,84,23,335	23,12,66,531	1,06,90,304	49,27,106	1,56,17,410	24,68,83,941	12,15,39,394	10,13,35,828
<b>4 VEHICLES</b>	32,28,380	20%	-	32,28,380	-	32,28,380	25,23,043	1,55,905	-	1,55,905	26,78,948	5,49,432	7,05,337
<b>5 FURNITURE, FIXTURES</b>	4,66,19,476	10%	-	4,66,19,476	1,75,508	4,67,94,984	2,15,64,261	34,35,082	16,142	34,51,224	2,50,15,485	2,17,79,499	2,50,55,215
<b>6 COMPUTER/PERIPHERALS</b>	2,13,72,008	20%	-	2,13,72,008	5,13,956	2,18,85,964	1,91,55,921	7,09,366	99,605	8,08,971	1,99,64,892	19,21,072	22,16,087
<b>7 COMPUTER SOFTWARE</b>	50,90,346	60%	-	50,90,346	12,82,835	63,73,181	38,29,897	3,86,866	5,38,248	9,25,114	47,55,011	16,18,170	12,60,449
<b>8 ELECTRIC INSTALLATIONS</b>	2,07,69,418	10% / 15%	-	2,07,69,418	-	2,07,69,418	1,24,48,599	13,46,056	-	13,46,056	1,37,94,655	69,74,763	83,20,819
<b>9 LIBRARY BOOKS</b>	1,18,26,157	20%	19,814	1,18,06,343	3,18,004	1,21,24,347	94,28,165	6,71,565	31,800	7,03,365	1,01,31,530	19,92,817	23,97,992
<b>10 OTHER FIXED ASSETS</b>	1,01,75,046	-	-	1,01,75,046	-	1,01,75,046	34,30,168	2,54,376	-	2,54,376	36,84,544	64,90,502	67,44,878
<b>TOTAL OF CURRENT YEAR</b>	<b>53,67,12,263</b>		<b>2,00,693</b>		<b>3,81,25,780</b>	<b>57,46,37,349</b>	<b>33,29,10,526</b>	<b>1,97,66,699</b>	<b>56,12,901</b>	<b>2,53,79,600</b>	<b>35,82,90,126</b>	<b>21,63,47,225</b>	<b>20,38,01,737</b>
<b>PREVIOUS YEAR</b>	50,27,61,499		9,195	-	3,39,59,959	53,67,12,263	32,15,85,390	82,99,034	30,26,103	1,13,25,137	33,29,10,526	20,38,01,737	18,11,76,109
<b>TOTAL (A)</b>	<b>53,67,12,263</b>		<b>2,00,693</b>		<b>3,81,25,780</b>	<b>57,46,37,349</b>	<b>33,29,10,526</b>	<b>1,97,66,699</b>	<b>56,12,901</b>	<b>2,53,79,600</b>	<b>35,82,90,126</b>	<b>21,63,47,225</b>	<b>20,38,01,737</b>
<b>B CAPITAL W.I.P</b>													
<b>CENTRAL PUBLIC WORKS DEPT</b>	20,57,913		-	-	-	-	-	-	-	-	-	20,57,913	20,57,913
<b>TOTAL (A+B)</b>												<b>21,84,05,138</b>	<b>20,58,59,651</b>

Note : The aforesaid 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 31.03.2022

**Schedule 9: Investments from Earmarked/ Endowment 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 )	9,59,50,605	9,29,11,234
8. Others (FD against LC)	6,37,225	1,03,26,125
<b>TOTAL (Rs.)</b>	<b>9,68,42,831</b>	<b>10,34,92,360</b>

**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
<b>TOTAL (Rs.)</b>	<b>0.00</b>	<b>0.00</b>

**Schedule 11: Current Assets, Loans & Advances**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>A. CURRENT ASSETS:</b>				
1. Inventories:				
a> Stores and Spares				
b> Publications	5,91,090		20,525	
c> Stock-in-trade of consumables (as taken valued and certified by the Management)	2,12,616	8,03,706	2,23,839	2,44,364
2. Sundry Debtors:				
a> Debts Outstanding for a period exceeding six months				
3. Cash balances in hand (including cheques/drafts and imprest)	15,000	15,000	31,378	31,378

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>A. CURRENT ASSETS:</b>				
4. Bank Balances:				
a> With scheduled Banks				
- On Current Accounts	2,98,15,472		2,26,57,119	
- On Deposit Accounts	-		-	
- On Savings Accounts	13,53,90,034		6,40,56,806	
- On Current Accounts(TDF)	4,12,84,178	20,64,89,684	2,50,63,811	11,17,77,737
b> With non-Scheduled Banks:				
- On Current Accounts	-		-	
- On Deposit Accounts	-		-	
- On Savings Accounts	-		-	
<b>TOTAL (A)</b>		<b>20,73,08,390</b>		<b>11,20,53,479</b>
<b>B. LOANS, ADVANCES AND OTHER ASSETS</b>				
1. Loans:				
a> Staff (For HBA, Vehicle Advance and Computer)	-		3,600	
d) Amount receivable from Schemes	22,97,205	22,97,205	23,91,995	23,95,595
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)	-		-	
c> Advances to staff (For TA etc.)	37,409		68,920	
e> Festival Advance	-		-	
f> Deposits kept with Govt. Agencies (MSEB, Telephone, Gas Cylinder etc.)	10,96,413	11,33,822	10,99,413	11,68,333
3. Income Accrued:				
a> On Investments from Earmarked/ Endowment Funds	32,72,003		22,27,237	
b> On Loans and Advances (HBA, Vehicle Adv. & Computer Adv.)	-		6,400	
4. Sundry Debtors	2,537		5,76,438	
5. Advance to Suppliers (Prior to 2013-14)	6,87,528		6,87,528	
6. Income Tax (TDS)	25,53,119		23,39,459	
7. Income Tax (TDS) (Prior to 2010)	6,21,213		6,21,213	
8. GST Input /Service Tax Input	42,03,324		32,03,563	
9. Kumar Krishi Mitra Fellowship	31,281	1,13,71,005	31,281	96,93,120
<b>TOTAL (B)</b>		<b>1,48,02,032</b>		<b>1,32,57,048</b>
C. NET CURRENT ASSETS AGAINST SPONSORED SCHEMES		5,84,56,123		6,34,92,829
<b>TOTAL (A+B+C)</b>		<b>28,05,66,545</b>		<b>18,88,03,355</b>

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

Schedules forming part of Income &amp; Expenditure Account for the year ended 31.03.2022

**Schedule 12: Income From Sales/Services**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Income from Sales		
a) Sales of Finished Goods (Farm Produce)	75,186	-
b) Sale of Raw Material	1,956	-
c) Sale of Scraps	52,392	-
d) Sale of Wistar Rats	32,080	-
2. Income from Services		
b) Cultural Identification Charges / Analytical Services	14,81,250	16,10,640
d) Others	9,105	89,698
e) Testing fees-Soyabean/Wheat	24,000	-
f) Consultancy Services	33,898	-
g) sale of wistar rates Gst Apply	89,460	-
<b>Total (Rs.)</b>	<b>17,99,327</b>	<b>17,00,338</b>

**Schedule 13: Grants/Subsidies**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Central Government	21,97,00,000	27,00,00,000
Add: Unspent balance at the beginning of the year	2,29,02,026	40,12,916
Add: Interest Earned on Grant (2021-22)	16,05,122	14,47,869
Less: Unspent balance at the year end	3,08,83,079	2,29,02,026
Less: Interest refund back to DST (2020-21)	14,47,869	7,31,864
	<b>21,18,76,200</b>	<b>25,18,26,895</b>
2. State Government	-	-
3. Government Agencies	-	-
4. Institutions/Welfare Bodies	-	-
5. International Organisations	-	-
6. Others (Specify)	-	-
Net Surplus of sale of Assets	-	-
<b>Total (Rs.)</b>	<b>21,18,76,200</b>	<b>25,18,26,895</b>

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

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

Schedules Forming Part of Income &amp; Expenditure Account for the Year Ended 31.03.2022

**Schedule 14: Fees/Subscriptions**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Entrance Fees (Library Membership fees)	19,200	24,000
2. Annual Fees(Licence fees)/Subscriptions	10,212	21,920
3. Seminar/Program Fees	-	-
4. Others (Ph.D. Tuition fee, Ph.D. Provisional Admission fee)	1,53,528	2,16,000
<b>Total (Rs.)</b>	<b>1,82,940</b>	<b>2,61,920</b>

**Schedule 15: Income From Investments**

Amount - Rs.

INCOME FROM INVESTMENTS: (Income on Invest. From Earmarked/ Endowment Funds transferred to Funds.)	INVESTMENT FROM EARMARKED FUND		INVESTMENT - OTHERS	
	CURRENT YEAR	PREVIOUS YEAR	CURRENT YEAR	PREVIOUS YEAR
1. Interest				
a> On Govt. Securities	0.00	0.00	0.00	0.00
b> Other Bonds/Debentures	0.00	0.00	0.00	0.00
2. Dividends				
a> On Shares	0.00	0.00	0.00	0.00
b> On Mutual Fund Securities	0.00	0.00	0.00	0.00
3. Rents	0.00	0.00	0.00	0.00
4. Others (Interest on bank deposits)	0.00	0.00	0.00	0.00
<b>Total Rs.</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>TRANSFERRED TO EARMARKED/ ENDOWMENTFUND</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

**Schedule 16: Income from Royalty, Publications, etc.**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Income from Royalty	-	-
2. Income from Publications	56	-
3. Others (Sale of Tender Forms/I Cards)	(40)	-
4. Application Money	60,280	-
<b>Total (Rs.)</b>	<b>60,296</b>	<b>-</b>

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

Schedules forming part of Income &amp; Expenditure Account for the year ended 31.03.2022

**Schedule 17 : Interest Earned**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. On Term Deposits		
a) With Scheduled Banks	-	-
b) With Non-Scheduled Banks	-	-
2. On Saving Accounts		
a) With Scheduled Banks	15,20,119	11,40,761
b) With Non-Scheduled Banks	-	-
c) Post Office Savings Accounts	-	-
3. On Loans		
a) Employees/Staff (On HBA, Vehicle and Computer Advance)	-	-
b) Interest Received on L.C	-	38,289
4. Interest on Debtors and Other Receivables	-	638
<b>Total (Rs.)</b>	<b>15,20,119</b>	<b>11,79,688</b>

\* Interest earned on DST grant &amp; HBA, Vehical &amp; Computer for F.Y 2021-22 added back to grant balance

**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	1,31,556	1,89,134
4) Miscellaneous Income	54,291	7,12,898
<b>Total (Rs.)</b>	<b>1,85,847</b>	<b>9,02,032</b>

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

Schedules forming part of Income &amp; Expenditure Account for the year ended 31.03.2022

**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	2,12,616	2,23,839
- Finished Goods	-	-
- Publications	5,91,090	20,525
	8,03,706	2,44,364
b) Less: Opening Stock		
- Laboratory Consumables	2,23,839	2,47,518
- Finished Goods	-	-
- Publications	20,525	20,525
	2,44,364	2,68,043
<b>Net Increase/(Decrease)</b>	<b>5,59,342</b>	<b>(23,679)</b>

**Schedule 20: Establishment Expenses**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1) Salaries and Wages	13,23,78,065	16,11,64,704
2) Allowances and Bonus	20,02,316	22,47,191
3) Contribution to Provident Fund & New Pension Scheme	1,67,62,203	1,36,87,104
4) Contribution to Other Fund (D.L.I.F.)	2,22,176	2,75,228
5) Staff Welfare Expenses	15,90,965	13,20,926
6) Expenses on Employees Retirement and Terminal Benefits	16,50,018	5,41,47,235
7) Stipend to Research & Fellowship Students	34,04,034	28,40,060
8) Encashment of Earned Leave for LTC	6,53,176	52,31,716
<b>TOTAL</b>	<b>15,86,62,953</b>	<b>24,09,14,164</b>

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

Schedules forming part of Income &amp; Expenditure Account for the year ended 31.03.2022

**Schedule 21: Other Administrative Expenses**

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
ADVERTISEMENT & PUBLICITY	92,366	3,23,703
AUDITORS REMUNERATION	2,01,160	14,920
ELECTRICITY & POWER	79,30,040	71,57,523
EXHIBITION ORGANISED BY ARAI	3,54,000	-
FARM EXPENSES	29,12,436	9,23,413
HOSPITALITY EXPENSES	1,50,599	35,562
INSURANCE	3,735	3,735
LEGAL & PROFESSIONAL FEES	5,91,704	2,98,000
OTHER OFFICE EXPENSES	3,37,573	2,46,645
POSTAGE, TELEPHONE & COMMUNICATION	3,45,379	5,25,392
PRINTING & STATIONERY	5,69,364	4,09,181
PURCHASES OF CHEMICALS & GLASSWARE	73,33,308	36,83,288
RENT RATES & TAXES	16,30,278	16,23,611
REPAIRS & MAINTENANCE	73,68,880	75,93,985
RETIRED STAFF MEDICAL EXPENSES	12,39,075	13,68,998
SECURITY & LABOUR EXPENSES	1,15,63,346	1,05,18,121
SEMINAR /WORKSHOP EXPENSES	1,54,991	2,35,281
SUBSCRIPTION FEES	1,20,124	1,76,721
TRAVELLING & CONVEYANCE	1,62,952	23,969
VEHICLE RUNNING AND MAINT EXPS	1,61,908	85,256
WATER CHARGES	13,36,299	12,18,422
<b>TOTAL (Rs.)</b>	<b>4,45,59,517</b>	<b>3,64,65,727</b>

**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
<b>TOTAL Rs.</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

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

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

Schedules forming part of Income &amp; Expenditure Account for the year ended 31.03.2022

**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)				
<b>TOTAL Rs.</b>		<b>0.00</b>		<b>0.00</b>

**Schedule D: Transfer to Capital Fund**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
<b>Other Fixed Assets</b>				
Books	3,18,004		8,10,476	
Buildings	-		16,54,866	
Computer / Peripherals/Softwares	17,96,791		18,36,891	
Office Furniture & Dead Stock	1,75,508		1,25,14,316	
App. & Equipments	3,58,35,477		1,65,27,366	
Electrical Installation	-		6,16,044	
Temporary Structures	-		-	
		<b>3,81,25,780</b>		<b>3,39,59,959</b>

As per our report of even date  
For **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**(D.K. SHARMA)**FINANCE & ACCOUNTS OFFICER  
MACS-ARI

Place: Pune

Date: 27-Jun-2022

**(P.K. DHAKEPHALKAR)**DIRECTOR  
MACS-ARI**Nikhil Gugale**Partner  
M. NO. 177609

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<sup>st</sup> March 2022

### 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 are transferred to Capital Fund

**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 **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**(D.K. SHARMA)**

FINANCE & ACCOUNTS OFFICER  
MACS-ARI

Place: Pune

Date: 27-Jun-2022

**(P.K. DHAKPHALKAR)**

DIRECTOR  
MACS-ARI

**Nikhil Gugale**

Partner  
M. NO. 177609

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 31.03.2022

**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 on 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 2022
1	Withdrawal Rate	3.00%
2	Discounting Rate	7.15%
3	Future Salary Rise	7.00%

The position of gratuity payable on death/retirement of employees and leave encashment as on 31<sup>st</sup> March, 2022 is as below:

PARTICULARS	PROVISION FOR GRATUITY	PROVISION FOR LEAVE ENCASHMENT
Opening balance as on 1 <sup>st</sup> April 2021	9,71,07,380	7,47,29,118
Add:- Addition during the year 2021-22	-----	-----
Less:- Deduction during the year 2021-22	65,40,911	43,41,229
Closing Balance as on 31 <sup>st</sup> March 2022	9,05,66,469	7,03,87,889

## 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 1<sup>st</sup> 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 figures are rearranged, recast or regrouped wherever necessary, to make them comparable with 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 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 of 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.

As per our report of even date  
For **A. R. SULAKHE & CO.**  
**Chartered Accountants**  
FRN: 110540W

**(D.K. SHARMA)**

FINANCE & ACCOUNTS OFFICER  
MACS-ARI

Place: Pune

Date: 27-Jun-2022

**(P.K. DHAKEPHALKAR)**

DIRECTOR  
MACS-ARI

**Nikhil Gugale**

Partner

M. NO. 177609





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

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