MACS

Annual Report 2023-24

Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

Vision

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

Mission

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

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

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

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

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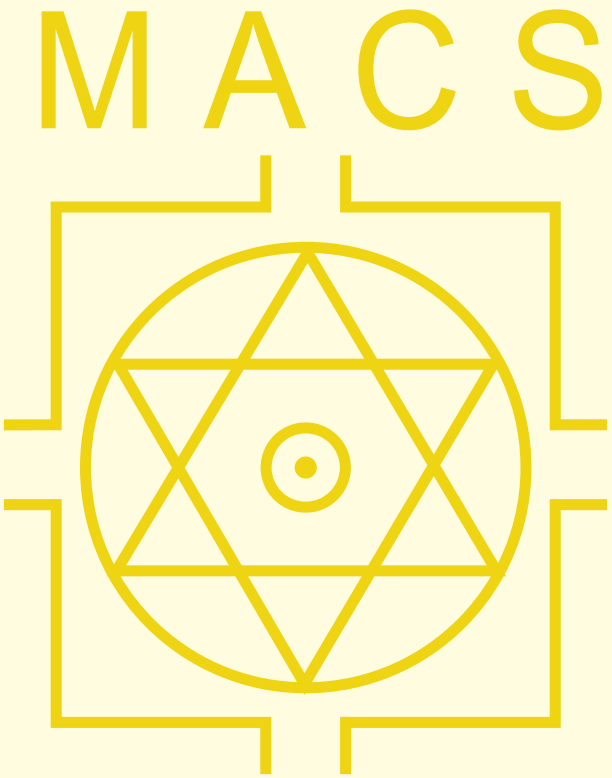
Correct Citation

Annual Report 2023-2024
Pune, India



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Dr G K Wagh, Technical Officer D, ARI

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Foreword

Dr Anil Kakodkar
President
Maharashtra Association for the Cultivation of Science
Pune

The Agharkar Research Institute continued its journey of excellence in research as well as research translation, around all six verticals, namely Biodiversity and Palaeobiology, Bioenergy, Bioprospecting, Developmental Biology, Genetics and Plant Breeding, and Nano-bio-science, during the year 2023-24 as well. The institute maintained its healthy research output through publication of more than 80 research papers, 16 book chapters, one monographs and a book. Ten students completed their Ph.D. this year. ARI's contribution to intellectual property was strengthened by the grant of six Indian patents in Nano-bio-science. Collaborations with industries, academic institutions, and government agencies have added to making a wider impact of ARI's scientific research. Visits of ARI scientists on fellowships to renowned German institutes, and their participation in international conferences has been a notable feature.

I am very happy that ARI has sustained its efforts in promoting Hindi and for the second consecutive year, the Agharkar Research Institute has been recognized for its outstanding contribution to Rajbhasha Hindi. This year ARI also bagged the 'DST Excellent Implementation Incentive Scheme' and 'DST Hindi Magazine Incentive Scheme' awards. These were presented to ARI at the hands of Prof. Abhay Karandikar, Secretary, Department of Science & Technology.

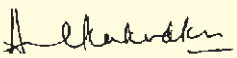
The month of November 2023 was abuzz with activities. Prof. Abhay Karandikar, Secretary, DST visited ARI to review the research work and lauded the contributions made by ARI in the areas of agriculture, nanotechnology, bioenergy, and life sciences. Prof. Karandikar's visit on 10th November and his interaction with ARI scientists proved morale booster for scientific community in ARI. Dr Rajesh S Gokhale, Secretary, Department of Biotechnology, was the Guest of Honour at the Founder's Day on 18th November. Dr Gokhale's address highlighted the advances made by India in the various areas of Biotechnology.

Workshops and training courses organised by ARI for capacity building are attracting a wide range of learners from undergraduates to college teachers. It is an indicator of the

desire of the students and teachers to grasp the latest in science and technology. The enthusiasm of ARI scientists in reaching out to science enthusiasts and popularising science is commendable. PhD students too are benefiting from these activities.

Organisation of various national programmes such as the National Science Day, National Technology Day, Hindi Day, Har Ghar Tiranga Campaign, Swachhata Special Campaign, India International Science Festival, Women's Day is increasing the contact between scientists, administrators, and related stakeholders. Effective use of social media in reaching out to the public has increased the visibility of ARI.

Before I conclude, I would like to take a moment to express my heartfelt gratitude to the dedicated scientists and staff at ARI, as well as the invaluable support and guidance from MACS life members. I also extend my sincere appreciation to the Department of Science and Technology, Government of India, for their ongoing encouragement.



Anil Kakodkar

26 September 2024

Executive Summary

Dr PK Dhakephalkar
Director
MACS-Agharkar Research Institute
Pune, India

The Agharkar Research Institute (ARI) has consistently been at the forefront of scientific research in India, focusing on addressing critical challenges in agriculture, biotechnology, and environmental science. The 2023-24 fiscal year marked another year of significant achievements, building upon the institute's legacy of innovation and excellence.

ARI's commitment to agricultural advancement has substantially improved crop yields and quality. Developing high-yielding and resilient soybean varieties has significantly benefited farmers in Maharashtra and beyond. By distributing quality breeder seeds, ARI has directly contributed to increased agricultural productivity and food security in the region. The institute's research in wheat breeding has also yielded promising results, with the development of improved varieties resistant to diseases and pests.

In sustainable energy, ARI has made significant strides in developing innovative solutions for bioenergy production. The institute's research on biomethanation of rice straw has the potential to revolutionize waste management and energy generation in rural areas. ARI contributes to a cleaner and greener future by converting agricultural waste into valuable biofuels. ARI's research in microbial sciences has led to groundbreaking discoveries, including identifying novel microorganisms with potential applications in biotechnology and environmental remediation. The institute's microbial diversity and ecology expertise has enabled it to develop sustainable solutions for various environmental challenges. The institute's commitment to biodiversity conservation has been exemplified by its research on plant diversity, ecological studies, and conservation genetics. By studying the genetic diversity of plant species, ARI aims to develop strategies for their conservation and sustainable utilization. The institute's work in paleobiology has provided valuable insights into the Earth's history and the evolution of life. ARI's research in nanotechnology and biotechnology has opened up new avenues for innovation in healthcare and materials science. The institute's scientists have developed novel nanomaterials with potential drug delivery, tissue

engineering, and environmental remediation applications. Additionally, ARI's research in biotechnology has led to the development of advanced bioprocesses that produce valuable biomolecules.

The institute's state-of-the-art research facilities, including the Zebrafish Facility and the Centralized Sophisticated Analytical Instrumentation Facility (SAIF), have enabled cutting-edge research. These facilities have provided researchers access to advanced technologies and techniques, fostering collaboration and innovation.

ARI's strong collaborations with national and international institutions have further strengthened its research capabilities. By working with leading scientists and researchers, the institute has addressed complex scientific challenges and achieved significant breakthroughs.

Thus, the Agharkar Research Institute has continued to excel in its scientific research and innovation mission. The institute's achievements in agriculture, biotechnology, environmental science, and other fields have positively impacted society. As ARI moves forward, it remains committed to addressing global challenges and contributing to a sustainable future.

The Institute (ARI) expresses its sincere gratitude to the members of the Research Advisory Committee, the Institute Council, and the Governing Body of the Maharashtra Association for the Cultivation of Science (MACS) for their invaluable guidance and support. Their insightful advice and encouragement have been instrumental in shaping the direction and focus of the institute's research endeavors. The institute is also deeply indebted to the Department of Science and Technology (DST), Government of India, for their generous financial support. The DST's continued commitment to scientific research has enabled ARI to undertake cutting-edge research projects and achieve significant milestones.

The success of the Institute is a testament to the unwavering dedication and hard work of its scientists, staff, and students. Their commitment to scientific excellence and their passion for innovation have been the driving force behind the institute's achievements. The institute is grateful for their invaluable contributions and looks forward to continued collaboration in the future.

PK Dhakephalkar
26 September 2024

ARI Scientists

Biodiversity and Palaeobiology Group


Dr Sanjay K Singh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Dr Ritesh K Choudhary


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Biodiversity and Palaeobiology

Biodiversity

Bacteria & Archaea

Conversion of methane to single-cell-protein using an indigenously isolated methanotroph *Methylomagnum ishizawai* KRF4

Methane, the second most important greenhouse gas in the form of natural gas is often flared and is being looked at as an alternative substrate for useful applications. A methanotroph, *Methylococcus capsulatus* Bath has been used for ~30 years for converting natural gas to single-cell proteins (SCP) useful as animal feed, in Europe. In the present study, we explored for the first time the use of an indigenously isolated methanotroph not explored for SCP production. We isolated *Methylomagnum ishizawai* strain KRF4, elliptical to rectangular size methanotroph with dimensions of ~4-5 µm x 1-2 µm (Figure 1) from a rice field in India. As the genus name suggests, *Methylomagnum* denotes a large size methanotroph. After several trials, a process was developed where strain KRF4 was grown in a static culture with biogas and air in the headspace (20:80), in a fish tank with ~20 L mineral medium. This method of obtaining methanotroph biomass is eco-friendly, and sustainable, and can be operated under semi-sterile conditions at ambient room temperature (28-32°C). The culture grows as a biofilm on the top making it easy to scoop the biofilm and the same medium could be used at least thrice. The bigger size of the cells

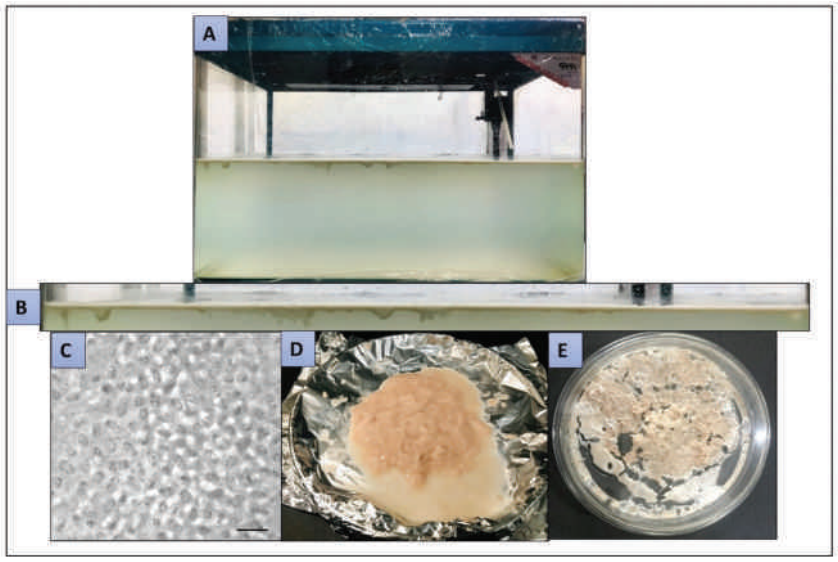


Figure 1
A. Scale-up of strain KRF4 in the fish tank where the gas inlet pipe can be seen, B. Thick biomass growth at water and gas interphase, C. Phase contrast micrograph of a heavily grown culture of *M. ishizawai* strain KRF4 in the fish tank, D. Buff coloured biomass harvested after centrifugation, E. Lyophilized biomass.

could be advantageous for separating biomass during downstream processing, e.g., centrifugation at a lower speed, or filtration. The amino acid composition of the biomass developed was comparable to commercial fish meal and the *Methylococcus*-derived SCP- UniProtein®, except a slightly lower percentage of lysine was observed in *Methylomagnum*-derived SCP. Further research towards developing a continuous and sustainable process to maximize biomass production and downstream processing may help us give an alternative for SCP derived from methane or biogas using the indigenous *Methylomagnum ishizawai* strain KRF4.

Methanotroph isolation from Terai ecozone

Cultivation studies on methanotroph communities dwelling in the Terai Forest ecozone were done, using soil samples from different ecosystems like grassland, marshy, and forest areas collected in each season and enriched for the isolation of methanotrophs (2022 and 2023) (Figure 2). The serial dilution enrichment followed by isolation on petri-plates resulted in the isolation of various strains of *Methylocystis rosea*, *Methylocystis hirsuta* (Type II methanotrophs), and *Methylobacter luteus* (Type I). Most forest methanotrophs usually are exposed to low methane concentrations due to the dry conditions present in summer and winter. Representative strains from all the above methanotrophs, grew in the presence of low methane (0.1% or 1% methane v/v) in the headspace, showing their affinity towards oxidizing low concentrations of methane.

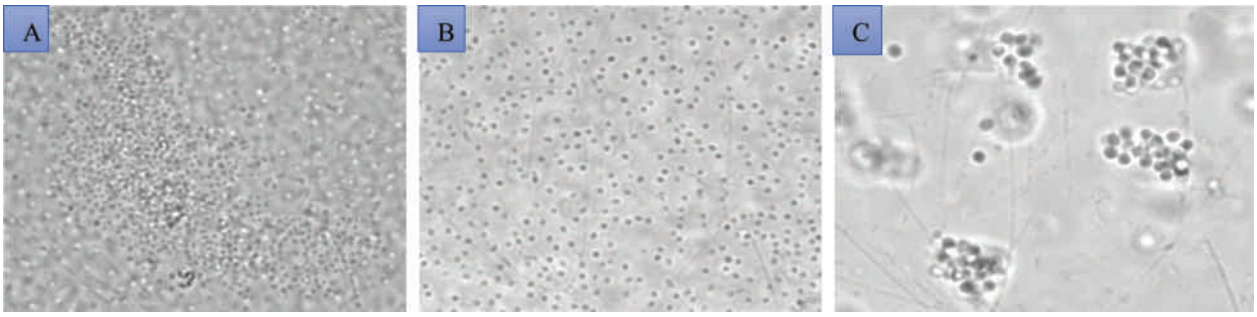


Figure 2
Methanotrophs isolated and identified using *pmoA* gene sequencing from 2022 summer soil samples. A. *Methylocystis hirsuta* isolated from Grassland ecosystem, B. *Methylocystis rosea* isolated from Marshy ecosystem, C. *Methylobacter luteus* isolated from Forest ecosystem.

Methanotrophs from a freshwater wetland patch (stone quarry at Vetal Hill) in Pune city

Wetland ecosystems act as important niches for methanotrophs, where their activities are important in controlling methane emissions from these sites. Our understanding of methanotrophs in tropical wetlands remains limited. We sampled a wetland ecosystem associated with a stone quarry situated amidst hills in Pune city (popularly known as Vetal Hill), one of the only natural green habitats, and a potential niche for diverse flora and fauna. This wetland patch (Figure 3) had vegetation in the form of aquatic weeds (*Typha* spp.) and small water plants. The samples exhibited a high abundance of methanotrophs ranging from 10^7 to 10^{10} per gram of fresh weight, revealing the presence of an active

Figure 3
Freshwater wetland patch in Pune (Vetal Tekdi stone quarry) from which samples were collected

methane cycle. Representative strains/cultures of type I methanotrophs from the genera: *Methylomonas*, *Methylococcus*, *Methylomagnum*, and *Methylocucumis* (Figure 4) were isolated/cultured from the lower dilutions: 10^{-3}–10^{-6}. Type II methanotrophs, *Methylocystis* spp., and *Methylosinus* spp. were isolated/cultured from the higher dilutions (10^{-9}). The isolated methanotrophs are being used as model organisms to study methane oxidation. These also would be used for methane mitigation and other applications such as single-cell protein production, pigment production, and plant growth promotion.

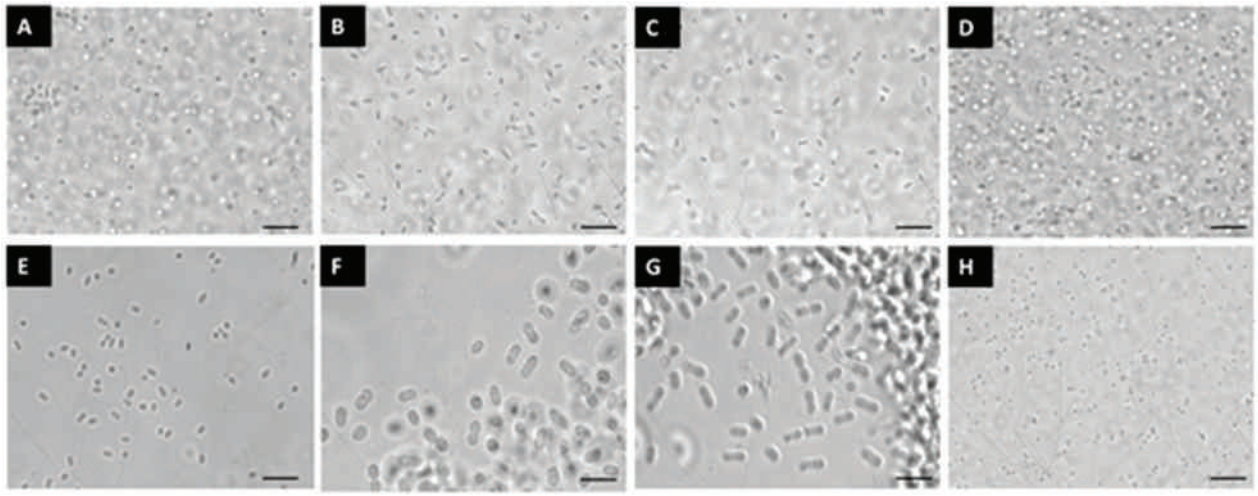


Figure 4
Microscopic features of live cells of isolated methanotrophs observed under 100X (oil immersion) magnification phase-contrast microscope (Nikon 80i, Japan microscope with a camera) A. *Methylosinus trichosporium* strain AQ1, B. *Methylomonas koyamae* strain AQ2, C. *Methylomonas koyamae* strain AQ3 D. *Methylococcus geothermalis* strain AQ4, E. *Methylomonas koyamae* culture SQ1 F. *Methylocucumis oryzae* culture SQ2, G. *Methylomagnum ishizawai* culture SQ3, H. *Methylocystis hirsuta* culture SQ4

Phylogenetically and physiologically diverse methanogenic archaea inhabit the Indian hot spring environments

Mesophilic and thermophilic methanogens belonging to the hydrogenotrophic, methylotrophic, and acetotrophic groups were isolated from Indian hot spring environments using BY and BCYT growth media. Following initial *Hinf* I-based PCR–RFLP screening, 70 methanogens were sequenced to ascertain

their identity. These methanogens were phylogenetically and physiologically diverse and represented different taxa distributed across three physiological groups, i.e., hydrogenotrophs (53), methylotrophs (14) and acetotrophs (3). Overall, methanogens representing three families, five genera, and ten species, including two putative novel species, were recognized. The highest number and diversity of methanogens was observed at 40 °C, dominated by *Methanobacterium* (10; 3 species), *Methanosarcina* (9; 3 species), *Methanothermobacter* (7; 2 species), *Methanomethylovorans* (5; 1 species) and *Methanoculleus* (3; 1 species). Both putative novel methanogen species were isolated at 40 °C and belonged to the genera *Methanosarcina* and *Methanobacterium*. At 55 °C, limited diversity was observed, and resulted in the isolation of only two genera of methanogens, i.e., *Methanothermobacter* (28; 2 species) and *Methanosarcina* (4; 1 species). At 70 °C, only members of the genus *Methanothermobacter* (5; 2 species) were isolated, whereas no methanogen could be cultured at 85 °C. This is the first study that documents the extensive range of cultivable methanogenic archaea inhabiting hot springs across various geothermal provinces of India.

Description of a new species of anaerobic thermophilic bacterium of genus *Thermoanaerobacterium* isolated from Tural hot spring in India

An obligately anaerobic bacterium CMT5567-10 was isolated from a sediment sample of Tural hot spring in Ratnagiri district of India. Cells of strain CMT5567-10 were motile long-rods, spore-forming and showed Gram-stain-positive reaction. The cells of strain CMT5567-10 were 2.0–3.0 µm long and 0.3–0.4 µm in width. Growth was observed at temperatures 45–70 °C (optimum 55–60 °C), pH 5.5–8.5 (optimum pH 7.0–7.5) and NaCl concentrations 0–0.5% (optimum 0%). Generation time of strain CMT5567-10 was 3.6 h under optimized growth conditions. Thiosulfate was utilized as an electron acceptor by the strain. Phylogenetic analyses based on 16S rRNA gene sequences showed that strain shared <99% homology with *Thermoanaerobacterium butyriciformans* DSM 101588T followed by *Thermoanaerobacterium aotearoense* DSM 10170T, identifying strain as a distinct species of genus Thermoanaerobacterium. Strain CMT5567-10 fermented glucose into hydrogen, ethanol, acetate and butyrate and showed ability to metabolize different complex and simple sugars constituting lignocellulosic biomass. The genome size of strain was 3.02 Mb with 33.8 mol% G+C content, and genes were annotated to carbohydrate metabolism, including genes involved in the degradation of cellulose and xylan and production of hydrogen, ethanol, acetate and butyrate. The digital DNA-DNA hybridization (dDDH), Average Nucleotide Identity (ANI), and Average Amino Acid Identity (AAI) values of 56%, 94%, and 94%, respectively, with nearest phylogenetic affiliate further validated the novel status of strain. Based on phenotypic and phylogenetic evidence, along with low identity at genome level, strain CMT5567-10T is a novel species of the genus Thermoanaerobacterium which we propose to name *Thermoanaerobacterium cellulofermentans* sp. nov.

Culturomics and metagenomics-based detection of microbes associated with microbial induced corrosion in subsea pipelines and evaluating the potential of different mitigation strategies.

Microbiologically influenced corrosion (MIC) is caused primarily by the direct or indirect action of microbial groups. The microbes involved produce several metabolites, including hydrogen sulfide and

organic acids that aid corrosion. Amongst microbes, bacteria, especially sulfate-reducing bacteria (SRB), acid producing bacteria (APB) and nitrate reducing bacteria (NRB), are reported to contribute the most to corrosion.

Sixty formation water and biofilm samples were collected from different oil reservoirs. These samples were characterized based on their pH, temperature, salinity, and the presence of sulfates. Based on these non-biological indications of microbial corrosion, nine samples were shortlisted, which were then subjected to further processing such as molecular analysis. Microbial diversity associated with MIC was studied by targeted metagenomic sequencing. The dominance and abundance of active microbial community members in formation water was investigated in the present study. Varied microbial diversity was observed among the samples. OTUs assigned till species level were screened for any designated SRB, APB and NRB, out of which only SRB and APB were majorly present across all samples. Fourteen different genera of SRB's were identified across the formation water samples. The presence of various SRB species across multiple formation water samples determines their significance in subsea pipeline environments and their potential role in microbiologically influenced corrosion. *Desulfobacter vibrioformis* was identified in both HQ and NJ samples, indicating its distribution across different sites. Similarly, *Desulfotignum balticum* was detected in N21, HQ, and NJ samples; *Desulfotomaculum thermocisternum* and *Desulfoglaeba alkanexedens* were found in N15, HQ, N21, LB, and NJ samples; *Desulfotignum toluenicum* and *Desulfovibrio dechloracetivorans* were detected in HQ and NJ samples; *Desulfomicrobium thermophilum*'s presence was detected only in N21 and HQ samples; *Desulfovibrio cavernae* was found in N8 and HQ samples, *Thermodesulforhabdus norvegica* appeared in N15, N21, and HQ samples; *Desulfacinum subterraneum* was found in N15, N21, and LB samples indicating their distribution across different sites. *Desulfonauticus autotrophicus* was identified only in the N21 sample, similarly, *Desulfacinum hydrothermale* was only detected in N15 and *Dethiobacter alkaliphilus* was found in the LB sample, suggesting a specific habitat preference.

Overall, the diverse presence of these SRB species highlights the complexity of microbial communities in subsea pipelines and emphasizes the need for further research to understand their specific roles in MIC processes.

Fungi & Lichens

Exploring the biodiversity of fungi from the Western Ghats and Indian Himalayas

The Western Ghats are considered a global hotspot for biodiversity because of their high endemism and biodiversity. The Western Ghats have a clear north-south gradient in rainfall and seasonality, as well as significant variation in the vegetation and terrain. In the Western Ghats, there is a persistent composite environmental state that supports novel and uncommon fungal species. Our focus is on the molecular reconsideration of previously described fungi whose taxonomic circumscriptions are unnecessary because of the obsolete, morphology-based identification methods, as well as the finding of novel fungi based on these methods. In the northern, central, and southern Western Ghats, we have carried out in-depth surveys and recorded more than 100 species. Throughout the reporting period, aquatic fungus, endophytes from medicinal plants, bioagents, foliar fungal diseases, mushrooms, alkali-tolerant fungi, endophytes from medicinal plants were among the terrestrial fungi and aquatic fungi that were

collected cultured In vitro, and their taxonomic identity were confirmed based on morphological and molecular analysis which are as follows: *Leveillula*, *Brevilegnia*, *Agrocybe*, *Macrolepiota*, *Irpex*, *Termitomyces*, *Taeniolella*, *Gymnopilus*, *Epiccocum*, *Colletotrichum*, *Zasmidium*, *Sarcinella*, *Corynespora*, *Alternaria*, *Cyathus*, *Cercospora*, *Melanospora*, *Mitteriella*, *Pilobolus* etc. Additionally, seven novel species and two new genera like *Kevinia* and *Groenewaldia* were discovered and reposted based on multigene phylogenetic analyses. Novel taxa reported are *Agaricus agha*rkarii, *Bipolaris heliconae*, *Fusarium indicum*, *Lambertella dipterocarpacearum* (Figure 5), *Metarhizium indicum* and *Penicillium sankaraniae*. An indigenous fungi *Excipulariopsis narsapurensis* previously placed under incertae sedis was rediscovered from northern Western Ghats regions of Maharashtra and taxonomic revision was made.

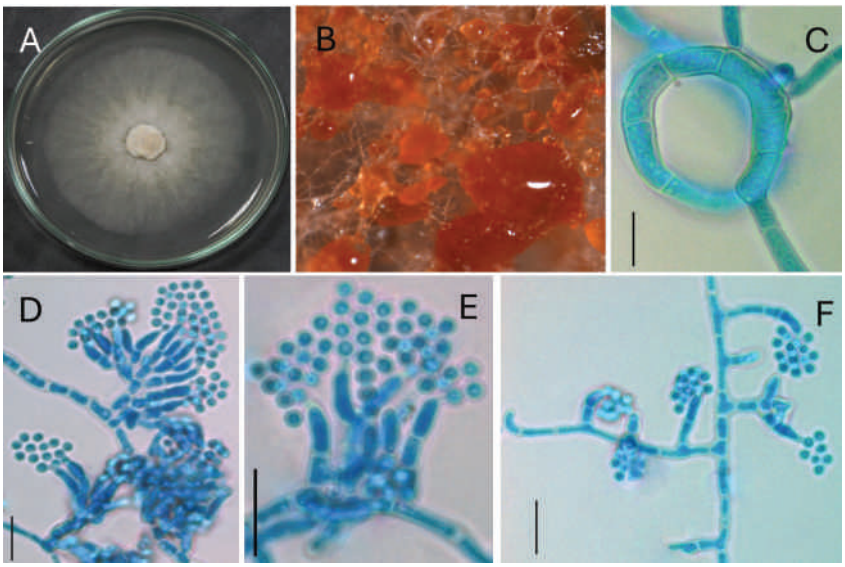


Figure 5
Lambertella diptero-carpacearum (AMH10226, holotype). A. Colony morphology on PDA (front view on 5th day), B. Stereomicroscopic surface view of colony showing dark orange shiny gleosporic mass of conidial heads, C. Coiled anastomosed hyphae, D-F Different types of patterns of conidiophores and arrangement of conidia on phialides

Studies on the family *Graphidaceae* and *Parmeliaceae* from the Western Ghats

Lichens epitomize the evolution of dual organisms on earth, composing a fungus, an alga, cyanobacteria, or both. *Parmeliaceae* and *Graphidaceae* form the world's largest and second-largest lichen families and form an important component of the Western Ghats lichen diversity. The Western Ghats region was extensively studied during the project. DNA isolation and multigene PCR protocols were standardized to identify and decode evolutionary relationships among the Myco and Photobionts for the first time in India, thereby untangling the symbiotic mysteries in lichen relationships in the Western Ghats bringing the phenomenon of algal switching and the degree of photobiont specificity and selectivity in Indian lichen flora to the limelight. Based on the principles of the classical taxonomy coupled with modern multigene phylogeny, thirteen *Graphidaceae* genera such as *Allographa, Chapsa*, *Corticorygma, Diorygma, Dyplolabia, Fissurina, Graphis, Hemithecium, Ocellularia, Phaeographis, Sarcographina, Thecaria* & *Thelotrema* and six *Parmeliaceae* genera such as *Hypotrachyna/ Rematotrachyna, Parmelia, Parmelinella, Parmotrema, Usnea, Xanthoparmelia.* were identified across the Western Ghats. The algal genera, such as *Trebouxia*, *Trentepohlia*, and *Printzina*, were found to be the photobiont genera associated with the collected lichens. Biomonitoring studies using the presence or absence of harmful heavy metals on the lichen thallus indicated the pristine and disturbed lichen habitats across the Western Ghats. The diversity analysis of lichens across latitudinal zones resulted in

the Central Western Ghats having more diversity, followed by the Southern and Northern Western Ghats. The correlation studies between the recorded biodiversity, forest types, environmental parameters and biomonitoring results help understand the lichen-rich areas and propose the sites that require conservation. The results also help predict possible lichen-rich regions of the Western Ghats and provide insights regarding establishing conservation sites for lichens.

Genome analysis of *Fusarium indicum*, a novel endophytic species

An endophytic *Fusarium indicum*, belonging to the *Fusarium concolor* species complex was established, isolated from *Bambusa* sp. collected from Himachal Pradesh. The identity of this isolate was confirmed based on the asexual morphs, its cultural characteristics, and phylogenetic analyses. This isolate was revealed to be distinct by showing less similarity with described species in the genus *Fusarium* based on molecular sequence data, with approximately 93.9% similarity based on translation elongation factor 1-alpha and 94.2% similarity based on RNA polymerase II subunit.

Furthermore, to increase knowledge about this novel species, whole-genome sequencing was carried out. The results displayed that *Fusarium indicum* NFCCI 5145 possesses a 40.2 Mb genome and GC content of 48.39%. Approximately 12,963 functional protein-coding genes were carefully predicted and annotated using different BLAST databases, such as Uniprot, Kyoto Encyclopedia of Genes and Genomes (KEGG), Gene Ontology (GO), Pathogen Host Interactions (PHI), Clusters of Orthologous Groups (COG), and Carbohydrate-Active enzymes (CAZy). The orthologous proteins were identified using OrthoFinder and used for phylogenetic analysis. ANIb confirmed that the isolate is closely related to the *F. concolor* species complex. It is known that *Fusarium* strains can produce a wide range of bioactive secondary metabolites. Therefore, in-depth mining for biosynthetic gene clusters for secondary metabolite biosynthesis of *Fusarium indicum* NFCCI 5145 was investigated using Antibiotics and Secondary Metabolites Analysis Shell (AntiSMASH) annotation. AntiSMASH results displayed that this isolate possesses 45 secondary metabolites of biosynthetic gene clusters (BGCs). These findings significantly improved our understanding of the Indian strain *Fusarium indicum* NFCCI 5145 and its applications in different sectors, including industry, for the secondary metabolites and enzymes it can produce.

Studies on fungal pigments and applications

Synthetic colors have been widely used for centuries in various industries, including food, textile, cosmetics, and pharmaceuticals. However, toxicity problems imposed by synthetic pigments have triggered intense research in natural colors and dyes. Among the natural sources, pigment-producing microorganisms hold a promising potential to meet present-day challenges and are already in use for carotenoid production in Europe or red pigment of azaphilone structure in Asia. Fungi are capable of synthesizing and are prolific producers of pigments as secondary metabolites of several chemical classes used in various industries such as food, cosmetics, paper, textiles, medicine, etc. The research work focuses on investigating pigment (including melanin) producing fungi and evaluating their bioactive potential for various applications in industries having promising prospects. More than twenty-five fungal cultures were isolated from the soil samples collected from various locations and showed positive melanin-producing potential. Subsequently, the pigment was biochemically characterized

through UV spectroscopy, FTIR, Elemental analysis and Thermo-gravimetric analysis. Following confirmation, the fungal cultures were tested for the quantification of melanin, and the pure melanin from one selected fungus was tested for its anti-microbial and anti-oxidant potential and DPPH radical scavenging assay. Melanin-producing fungi were identified based on an integrated approach of morpho-molecular characteristics.

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

Smilax L., commonly known as Sarsaparilla or greenbriers, serves as the sole genus of the Smilacaceae plant family. This genus encompasses approximately 262 species distributed across tropical, subtropical, and temperate regions worldwide. Characterized by climbing vines often adorned with prickles on the stem and paired petiolar tendrils, *Smilax* holds significance both medicinally and commercially, being utilized as a flavoring agent in various food, beverage, and pharmaceutical products. Within traditional medicine, its rhizomes are esteemed for their diverse therapeutic properties, including anti-inflammatory, antihypertensive, antirheumatic, antifungal, anti-pruritic, antiseptic, healing, diuretic, and tonic effects. However, identifying species within the genus *Smilax* poses challenges due to their close morphological resemblance, leading to issues of adulteration. Against this backdrop, our current research endeavors aim to achieve several objectives: (i) revising the taxonomy of Smilacaceae in India, (ii) elucidating the morphological evolution and diversification patterns of *Smilax* species in the Himalayan region, and (iii) developing DNA super-barcodes for key Indian *Smilax* species utilizing phylogenomic data. During the reporting period, extensive field tours were conducted in Nagaland, Assam, and Arunachal Pradesh, resulting in the collection of leaf samples from several *Smilax* species. Additionally, DNA super-barcodes were developed for the medicinally important *Smilax zeylanica*. Furthermore, comprehensive documentation of Smilacaceae in the Indian subcontinent has been completed because of our taxonomic study. In addition, *Smilax turbans*, a native Indian species was rediscovered from Arunachal Pradesh after a gap of 98 years (Figure 6).

Figure 6 *Smilax turbans* Wang & Tang was rediscovered from Arunachal Pradesh after a gap of 98 years

Systematic studies on the genus *Canscora* Lam. (Gentianaceae) in India

The genus *Canscora* Lam., belonging to the tribe Canscorinae within the Gentianaceae family, encompasses fourteen species globally, with ten of these species found in India. This genus presents numerous taxonomic complexities, yet none of the taxonomic treatments have undergone molecular examination. Additionally, certain plants within the genus possess medicinal significance, such as *Canscora alata* (Roth Wall.), which is part of the *Shankpushpi* group known for its effects on the central nervous system. Despite its potential for bioprospecting, there have been no efforts to understand the taxonomy and relationships of *Canscora* species within the genus since Thiv's work in 2003. Molecular tools have not been utilized to validate taxonomic treatments, and there has been no exploration of anatomical variations or investigations into the transition of key floral patterns. Therefore, there is a pressing need to clarify the systematic position of various *Canscora* species and resolve the complexities associated with taxonomically uncertain species. To address these issues, this study aims to achieve the following objectives: A. Revisit the taxonomy of the genus *Canscora* Lam. B. Investigate anatomical features to understand floral organization in *Canscora*, particularly focusing on the anisomorphy of the androecium. C. Resolve species complexes within *Canscora* and validate the status of *Canscorinella* using molecular tools. Field surveys were conducted in various locations across Maharashtra, Karnataka, Kerala, and Tamil Nadu, where multiple DNA and herbarium samples were collected. These samples were meticulously identified using Floras, relevant literature, and consultation with multiple herbaria. DNA isolation was performed using the CTAB method from silica-gel dried leaf material in preparation for molecular research.

Therapeutic investigations and isolation of bioactives from *Haplanthodes* species, the wild relatives of *Kalmegh*

The genus *Haplanthodes* Kuntze, a member of the Acanthaceae family within the Andrographideae tribe, shares a close phylogenetic connection with *Andrographis* Wall. ex Nees (commonly known as Kalmegh). Despite its origin in India, this genus remains relatively unexplored in terms of its potential for bioprospecting. Throughout the specified period, numerous field expeditions were conducted across various regions of Maharashtra, Tamil Nadu, Karnataka, and Kerala. Inter- and intra-specific morphological variation, distribution, phenology, utilization, and other pertinent details were studied. Phytochemical screening and standardization tests were carried out to isolate active compounds from *Haplanthodes*, with a focus on investigating their therapeutic attributes.

Phytochemical and pharmacological investigations of some selected unexplored endemic species of Apiaceae family of Northern Western Ghats

In India, the family Apiaceae has 240 species. Many species are used as food flavoring agents for foods and medical purposes. Most of these species are yet to be explored to their full potential. Chemically, most of the Apiaceae family species are aromatic and can synthesize monoterpene, essential oils, sesquiterpene essences, phenyl components, and allied resins. Species of this family are ubiquitous and available easily. The present investigation is designed to evaluate the efficiency of the extracts, their bioactive fractions, and isolated pure phytoconstituents from some uninvestigated aromatic plants of the Apiaceae family. *Pimpinella heyneyana* was collected and the chemical composition of the essential oil present in the leaves was analyzed. Its antimicrobial efficacy against a range of pathogenic microorganisms was tested.

Desiccation-tolerant vascular plants from Western Ghats, India: review, updated checklist, future prospects and new insights

Northern Western Ghats escarpment is the first Indian cliff system investigated to study the plant life and plant-environment association. 329 taxa of vascular plants, and 41% substantial vegetation cover were documented. We recorded 62 species exclusively growing on the cliffs and 47 species endemic to NWG cliffs. Twenty-six desiccation-tolerant species were recorded from the NWG. The study underscores the significance of microhabitats on cliff faces and calls for further research on cliff vegetation impact and disturbance, emphasising the importance of sustainable tourism practices and conservation awareness initiatives for the preservation of fragile ecosystems in the region.

In-vitro regeneration of *Crinum* species and their bioprospecting potential against Alzheimer's disease

Crinum is a large genus of perennial plants. Species like *C. asiaticum, C. woodrowii, C. pretence, C. latifolium, C. viviparum* etc. are mostly found in Maharashtra. We focused on study of in-vitro propagation of *C. woodrowii* because it is an endangered and rare species. These plant species were collected from Ambavane, Pune District, Maharashtra. Under aseptic conditions twin and tri-scale culture were followed for initiation of bulb culture. Following a two-month incubation period, shoots and roots were discovered on MS media that had been enhanced with plant hormone cytokinins and auxin. The seed of *C. viviparam* germinated to form a long plumule while *C. woodrowii* demonstrated that shootlets developed from meristematic initials of the twin scale's basal plate (Figure 7). The species were hardened by growing them in soil inside the greenhouse under appropriate environment. The bulbs were used to extract galantamine, quantify and analyse.

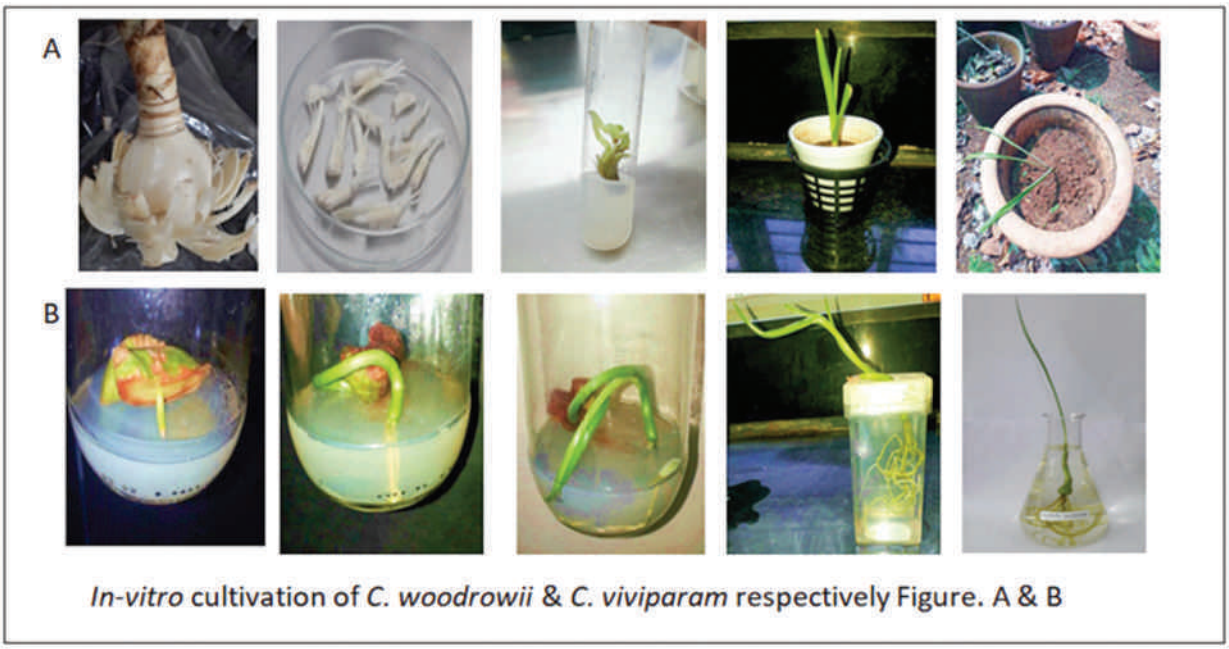


Figure 7
In-vitro cultivation of *C. woodrowii* (A) & *C. viviparum* (B)

Systematic studies on Ischaeminae J. Presl (Andropogoneae-Poaceae) in India

Ischaeminae is the ecologically important subtribe holding 44 taxa endemic to India out of 56 taxa known from the country. *Ischaeminae* is characterised by the fascicled inflorescence, paired spikelets - one sessile and other pedicelled, disarticulated rachis and each spikelet bearing two florets-one bisexual and other staminate or neuter floret. Subtribe *Ischaeminae* is represented by six genera viz. *Andropterum*, *Ischaemum, Kerriochloa, Nanooravia, Pogonachne,* and *Triplopogon.* There are taxonomic disputes in the placement of some genera in *Ischeminae,* such as *Apluda, Thelepogon* and *Sehima*. There has been no focused work on *Ischaeminae* after Sur (1978). Efforts are being made to understand the placement of genera in this subtribe and to resolve taxonomic ambiguities. Till today, more than 350 accessions of different taxa belonging to Ischaeminae have been collected and identified. Of these 48 species belong to *Ischaemum,* and one species each belongs to the genus *Apluda, Thelepogon, Triplopogon,* and *Sehima*. DNA isolation, PCR amplification, phylogenetic analysis and sequencing of species belonging to the genus *Ischaemum* are completed.

Forest ecology of Northern Western Ghats

A quantitative study investigated the impact of disturbance on tree vegetation in forest fragments of the Northern Western Ghats. Forty transects were surveyed, encompassing 3360 individuals across various protection regimes, including sacred groves, protected areas, reserve forests, and private forests. Although these regimes exhibited a 50% similarity in species composition, they showed significant differences in structural attributes such as tree density and basal area. Despite being highly disturbed, sacred groves were found to harbor large and evergreen trees. In contrast, protected areas were observed to conserve young individuals of many tree species. The decline in the number of evergreen species at higher disturbance levels raises concerns, as evergreen trees play a significant role in biomass accumulation, serving as a proxy for carbon storage. This study underscores the importance of conserving sacred groves and evergreen species in the Northern Western Ghats of Maharashtra. By safeguarding these habitats and their associated tree species, efforts can be made to maintain biodiversity and ecosystem functionality in this ecologically significant region.

Diatom diversity from lowland alkaline lakes of the Southeast coast of India

Due to its alkaline nature, the diversity of diatoms inhabiting the lowland lakes within the Southeast coast of India is an area of burgeoning scientific interest. These wetlands are interconnected irrigation tanks found within southern India's semi-arid regions. They are interconnected by an ancient network of canals and nourished by rivers originating from the Western Ghats. Despite their socioeconomic and cultural significance, the ecological value of these irrigation tanks remains largely unexplored, especially the physicochemical nature of water and diverse life forms. This study focused on diatoms, one of the most diverse organisms across various microhabitats in the wetlands. Our survey spans 34 irrigation tanks of varying sizes. These lakes exhibit a wide range of characteristics, from alkaline pH levels ranging 8-10 and varying degrees of water quality ranging from pristine to highly polluted, with electrical conductivity levels spanning from 100 to 2000 µS/cm. Light microscopy analysis of 25 samples documented more than 150 diatom species. Among the most dominant genera (Fig. 7) are *Achnanthedium*, *Amphora*, *Aulacoseria*, *Coloneis*, *Cymbella*, *Diploneis*, *Discotella*, *Encyonema*, *Fallacia*, *Fragilaria*, *Gomphonema*,

Mastogloia, *Navicula*, *Nitzschia*, *Pinnularia*, *Placoneis*, *Planothedium*, *Pseudostaurosira*, *Rhopalodia*, and *Sellaphora*. Statistical analysis revealed the presence of four distinct diatom communities based on species composition in the lowland alkaline wetlands of the southeast coast of India. Variations in environmental factors such as habitat type, water pH, dissolved oxygen, electrical conductivity and human activities played significant roles in shaping these communities. The prevalence of unidentified taxa underscores the urgent need for comprehensive documentation of the diatom diversity of these alkaline wetlands. Additionally, our analysis highlights these lakes' significant threats and emphasises the urgent need to implement necessary safeguards to protect and preserve their ecological integrity.

Diatoms: Exploring biochemical composition and potential in aquaculture

We collected samples of diatoms from the coast of Maharashtra, isolated single cells, and established monocultures under controlled laboratory conditions (Figures 8, 9). These monocultures were then scaled up to 20 litres for shrimp feeding experiments. We studied marine diatoms to understand their growth pattern, biochemical composition, and applications in aquaculture industries.

We focused on extracting and quantifying lipids, carbohydrates, and proteins, as these compounds are crucial for evaluating the nutritional value and potential applications of diatoms in various industries. Our analysis revealed significant variations among diatom strains regarding carbohydrate, protein, and

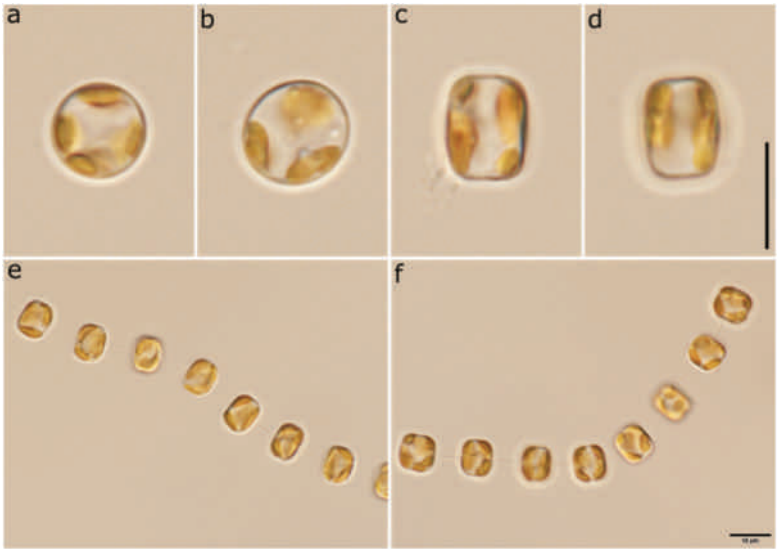


Figure 8
Live light micrographs of c285 cells. a&b - valve view; c&d - girdle view and e&f - chain formation by *Thalassiosira* sp. (c285) cells. Scale bar - 10µm.

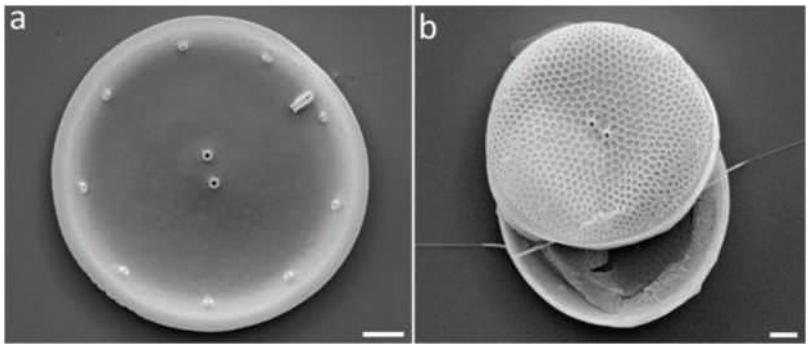


Figure 9
Scanning electron micrographs of *Thalassiosira* sp. (c285) cells. a. internal structure of the valve, b. external structure of the valve. Scale bar - 1µm.

lipid production. Carbohydrate production ranged from 3.85 to 40.6 milligrams per litre, protein production from 156.2 to 173.91 milligrams per litre, and lipid production from 650 to 2466.7 milligrams per litre. The results underscore the intricate interplay of biochemical components within diatom cells and their crucial role in advancing sustainable practices within the aquaculture industry.

The implications of our research extend beyond the laboratory, offering exciting possibilities for industries and communities seeking innovative and environmentally friendly solutions.

Exploring the seasonal diatom diversity across the pollution gradient of Mula-Mutha river basin

The Mula-Mutha River basin, situated in the Pune district of Maharashtra, is a sub-basin and the source of the Krishna River, which falls into the Bay of Bengal. For the past several decades, the river has constantly been subjected to numerous anthropogenic pressures, such as increasing pollution, which impact the dynamics of rivers and affect human needs. To address this, routine monitoring of the riverine systems is required, which can be done by measuring physicochemical parameters and employing biological indicators. Diatoms are popularly used as apt bioindicators to measure freshwater ecological quality because of their sensitivity to environmental changes and diversity in all aquatic systems. They are also known to show seasonal variation and changes in the ecological status of the rivers. With this background, we selected 19 sampling sites from upstream to downstream river stretch. We collected more than 250 diatom samples in the pre-monsoon, monsoon and post-monsoon periods for two years (2022 and 2023) to observe the seasonal and temporal dynamics of the river. The diatom composition and physicochemical parameters showed seasonal variation. We have documented over 100 diatom species. In the upstream river stretch, diatoms such as *Pantocsekiella ocellata*, *Discostella stelligera*, *Aulacoseira granulata,* etc. were dominant. In the midstream stretch of the river, dominant species that could thrive were *Cymbella pavanensis*, and *Reimeria uniseriata*. In the downstream stretch of the river, diatoms such as *Nitzschia palea* and *Encyonema javanicum* were predominant. The water quality parameter, electrical conductivity, showed an excellent gradient across the upstream to downstream stretch of the river, 42.8 - 1887 µS/cm. The low electrical conductivity values were recorded in the upstream river sites. High values were recorded in the downstream stretch of the river. The diatom composition in the upstream river stretch indicated an oligotrophic status of the river due to minimum human disturbance; the midstream diatom composition indicated mesotrophic condition, which could be due to agricultural activities and embankments to reduce the flow of water and downstream diatom community indicated eutrophic condition of the river attributed by the urban settlements and increasing industrialisation.

Palaeobiology

Marine Microscopic Miners: Two new species of Psammophaga (Foraminifera: Protist) discovered from coastal Maharashtra showed unique behaviour of engulfing and retaining titaniferous heavy minerals inside the cytoplasm

The benthic monothalamid foraminifer genus *Psammophaga* has a unique ability to engulf and retain mineral grains in its cytoplasm. In our study from the coastal intertidal environments of the Rajapuri

Creek, Raigad district, Maharashtra (Arabian Sea), we have described two new species of Foraminifera genus *Psammophaga* employing both morphological and molecular approaches, in tandem. As a characteristic of this genus, both the species showed concentration of mineral particles inside the cytoplasm. Furthermore, elemental analysis revealed selective preference for uptake, engulfing and accumulation of the mineral particles rich in heavy opaque minerals such as Titanium, Vanadium, Iron, and Copper, from the ambient marine sediment environment of Rajapuri Creek. *Psammophaga* are an excellent bioindication and may potentially be beneficial in identifying marine realms rich in economically significant heavy minerals.

Bioenergy

Demonstration of a process for biomethanation of rice straw at a high substrate loading rate

A process was developed for the biomethanation of rice straw by bioaugmentation of an anaerobic fungus *Orpinomyces* with cattle dung slurry as the primary inoculum. This process operated at mesophilic conditions without thermochemical pretreatment, using particulate rice straw (5-10 mm in size) at a substrate loading rate of 10.5% and a carbon:nitrogen ratio of 30:1, with a 15-day hydraulic retention time. An optimal methane production of 250-300 L Kg^{-1} volatile solids was achieved. Additionally, an assessment of the fertilizing capabilities of the resulting digestate slurry indicated its alignment with the recommended BIS standards. The operational continuity of the process was retained over an extended period, establishing stability through more than 30 hydraulic retention time cycles without any operational disruptions caused by acid accumulation. This prolonged and uninterrupted operation not only underscores the robustness of the developed process but also emphasizes its potential for commercial viability, offering increased returns to farmers for their lignocellulosic yield.

Comprehensive assessment of health-promoting attributes of probiotic cultures

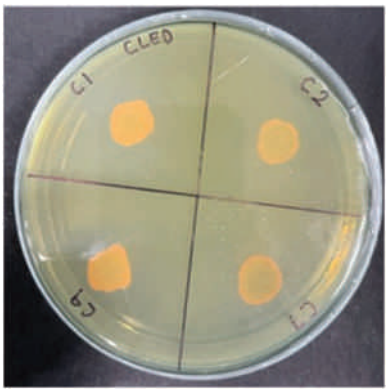
Probiotic bacteria have garnered increasing attention owing to their potential benefits for gut health and overall well-being. Understanding the multifaceted functionalities of probiotics is crucial for harnessing their potential in promoting a healthier lifestyle. In this study, we conducted a comprehensive evaluation of probiotic cultures to assess their protease, beta-galactosidase, bile salt hydrolase and antioxidative activity, cholesterol-reducing ability and short-chain fatty acid (SCFA) production. The whole genome sequence of the probiotic bacteria was analyzed to identify marker genes associated with biosynthetic capabilities and health-promoting attributes.

Probiotics require amino acids for growth, and their protease activity aids in protein breakdown, facilitating nutrient absorption and growth promotion. Our investigation revealed the extracellular proteolytic system of probiotics. Lactose intolerance affects a significant population worldwide, and probiotics with high beta-galactosidase activity offer promising solutions. The cultures showed beta-galactosidase activity and the presence of the corresponding gene in the genome. Some probiotic cultures displayed bile salt hydrolase activity. The BSH activity of probiotic cultures suggests a mechanism for reducing serum cholesterol levels by aiding in bile acid metabolism (Figure 10). The probiotic cultures demonstrated strong DPPH free radical scavenging activity, suggesting their potential as antioxidants. Genes encoding antioxidant enzymes were also found in their genomes. The cultures

exhibited cholesterol-assimilating potential in simulated gastrointestinal environments. Genes associated with cholesterol reduction were identified in their genomes. Genome analysis to explore the biosynthetic capabilities of probiotic bacteria revealed the genes involved in synthesizing essential vitamins and amino acids indicating its potential to contribute to gut nutrient availability. Additionally, the production of SCFAs by probiotic cultures from fermentation of prebiotics highlights their potential in modulating gut-brain communication and function.

This study provides comprehensive insights into the health-promoting attributes of probiotic cultures. Further research is warranted to elucidate the mechanisms underlying these beneficial effects and optimize the use of probiotics for improving human health and well-being.

Protease Activity: Zone of clearance around the growth of probiotic culture on skimmed milk agar



Beta-galactosidase activity: Yellow color of probiotic culture on CLED agar indicates the hydrolysis of lactose

Bile Salt Hydrolase activity: The precipitation on and surrounding the growth on MRS supplemented with 0.5% TDCA (bile salt) and 0.037% $CaCl_2$ is considered as positive BSH activity.

Figure 10 Enzyme activities exhibited by probiotic cultures

Bioprospecting

Bioprospecting is the discovery and commercialization of new products based on biological resources. The focus of research is on the isolation and synthesis of naturally occurring compounds, derivatives and their use in pharmaceuticals, nutraceuticals, agriculture and industries. Focus is also on deciphering the mechanistic approach of these compounds for disorders such as Alzheimer's disease, anemia, diabetes, cancer, and chikungunya virus.

Natural Product Chemistry

Bioprospecting and taxonomic studies of lichens from Northwestern ghats

The taxonomic base line data has been procured through collections at various high level ferricretes (HLF) and basalt mesa (BM) from the Northwestern ghats of Maharashtra. Number of specimens collected from HLF at Panchgani, Kas, Ajinkyatara, and basalt plateaus (BM) Anjaneri, Durgawadi, and Sinhagad earlier have been studied. The studies have resulted into 41 species distributed over 18 genera and 11 families. Of these Anjaneri has recorded 13 lichen species, Durgawadi 31 lichen species and Sinhagad 41 lichen species. Five species are being reported as new to India viz. *Peltula bolanderi* (Tuck.) Wetmore *Peltula brasiliensis* (Zahlbr.) Büdel, Kauff & Bachran, *Peltula cataractae* (Büdel & Sérusiaux) Büdel, Kauff & Bachran, *Peltula sonorensis* Büdel & T. H. Nash, and *Peltula polyphylla* Q.X. Yang & X.L. Wei. *Heppia*

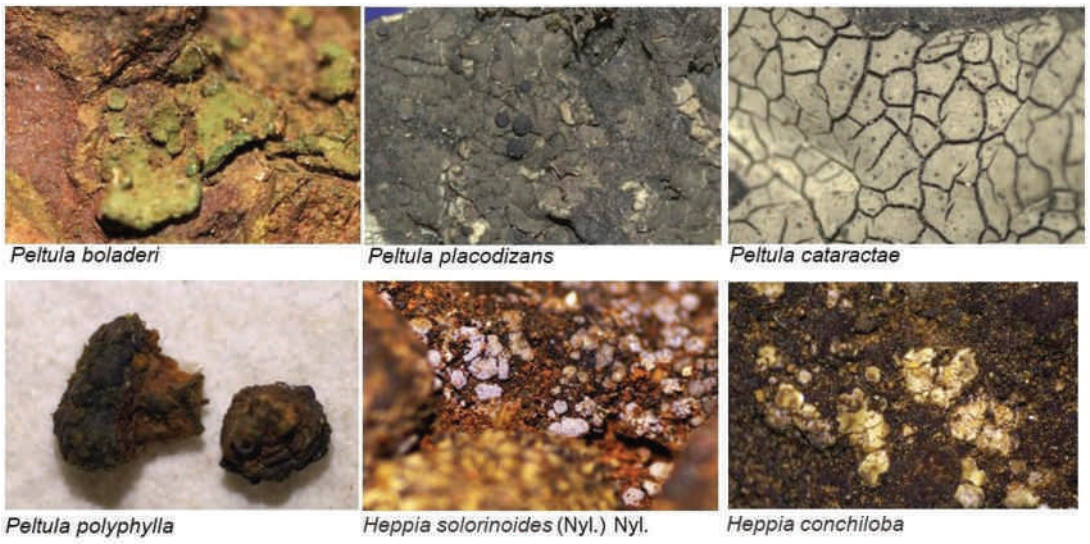


Figure 11 New lichen records

conchiloba Zahlbr. and *Heppia solorinoides* (Nyl.) Nyl. (Figure 11). *Collema conglomeratum* var. *crassiusculum* (Malme) Degel. and *Collema leptaleum* var. *bilosum* (Mont.) Degel. has been reported from Maharashtra after a gap of 48 years. The lichens have been collected on the HLF and BM of the Northwestern ghats of Maharashtra at an elevation of approximately 1200 m.

Medicinal Chemistry

Studies on selected *Crinum* species from Maharashtra for their bioprospecting potential against Alzheimer's disease (AD)

Crinum woodrowii is endemic plant and found only at specific locations like hill slopes and cliffs along evergreen and semi-evergreen forests. This Amaryllidaceae family member showed presence of galantamine, an alkaloid having reversible anticholinesterase activity which is used for the treatment of dementia. The genus *Crinum* traditionally has been used to treat a range of ailments including dementia. *C. woodrowii* was collected from various climatic regions of Ambavane ghat, Lonavala. *In-vitro* regeneration was successfully carried out. For comparative analysis, five crinum species were selected as a source of explant. For further inoculation of explant, twin and triscale culture was initiated for induction of shootlets. Optimum growth conditions were provided to culture for maximum proliferation. We focused on growing disease-free plants to maintain sterile conditions. During this report period, we have carried out *in-vitro* regeneration and qualitative and quantitative analysis of galantamine content of crinum species. For this, crinum bulbs were collected, cleaned and then air dried. Air-dried powder was extracted with ethanol for 24 h with intermittent shaking. The extract was filtered and concentrated at lowered temperature and pressure by using rotary evaporator. Dried extract was weighed and preserved at 4°C for further investigation. Extracts were qualitatively and quantitatively analyzed for galantamine content by High Performance Thin Layer Chromatography (HPTLC) and High-Pressure Liquid Chromatography (HPLC) respectively. Correlation of ecological, soil and climatic conditions on galantamine content of different Crinum species will be carried out using multivariate analysis. This will help to understand growth requirements of the crinum species for optimal galantamine content. HPTLC of crinum extract was carried out to check the presence of galantamine. *Crinum woodrowii* bulbs collected from natural habitat showed high amount of galantamine was found to be 1.6816 mg/ml as compared to other *Crinum* species.

Extraction of orange peel with conventional and green method and their characterization with LC-MS/MS-QTrap

The bright color of the orange peel is attractive but considered as food waste. Till 2021, the production of citrus fruit and juice industry has exponentially increased up to 161.8 million tons per 10.2 million hectares. Simultaneously, it generated huge amount of waste material every year such as peel in large amount along with seeds and membranes. According to triple R environmental task, every waste should be processed and converted into useful products to reduce environmental burden. Orange peel has can be utilized as dietary fiber, flavoring agent, natural cleaner, animal feed, biofuel production, confectionary, cosmetics and pharmaceutical applications. We have extracted orange peel through a supercritical fluid extraction method to obtain phytoconstituents and soxlet extraction using methanol and hexane. All the extracts were analyzed with liquid chromatography mass spectrometry with QTrap functionality. Hesperidin was isolated from the methanolic extract.

Developmental Biology

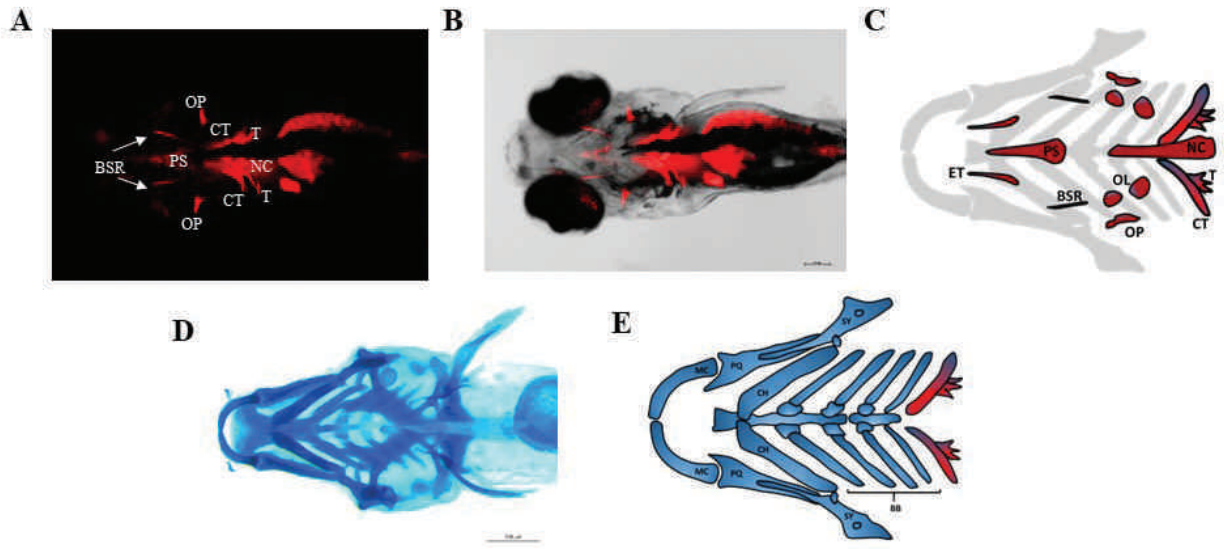
We study cellular and signaling mechanisms underlying morphogenesis, synaptic plasticity and inter-organ signaling. We combine genetics with molecular biology and imaging in our studies.

Elucidating signaling mechanisms regulating glial morphogenesis and synaptic plasticity in *Drosophila*

To understand form-function relationship in glia, we focus on subperineurial glia (SPG) which give rise to the blood-brain-barrier. Glia are large polyploid cells that ensheath the entire brain. The relatively stereotyped organization of these cells in the ventral nerve cord makes it an attractive system to understand mechanisms underlying cell shape change. We are studying how GPCR signaling activated by Folded gastrulation regulates morphology of SPGs to ensure barrier integrity. Ongoing studies are aimed at identifying cellular and molecular mechanisms involved in maintaining barrier integrity. The other aspect of our work involves studying the role of MC1 complex in regulating glutamate receptors at the third instar larval neuromuscular junction. Our current efforts are aimed at elucidating the mechanism of transsynaptic anterograde regulation of glutamate receptors by this complex.

Itga8 is required for craniofacial development in zebrafish

Integrins, a membrane-bound heterodimeric cell surface receptor, comprises two glycoprotein subunits, α and β. Among them, Itga8, a member of the integrin α family, forms a functional unit with the β1 subunit. It plays a crucial role in development and disease. Knockout of *itga8* in mice results in kidney morphogenesis defects and postnatal lethality. Developmental studies in zebrafish reveal that *itga8* mutation leads to craniofacial abnormalities, yet the detailed molecular mechanisms remain unexplored. We elucidated the spatiotemporal expression pattern of *itga8* and the loss-of-functions of itga8 in early morphogenesis. mRNA in situ hybridization as well as reporter gene expression data, showed predominant *itga8* expression in the pharyngeal arches. Employing CRISPR-Cas9, we generated a loss-of-function mutant allele of *itga8*. *itga8*$^{-/-}$ embryos are morphologically indistinguishable from their wild-type siblings. Around 6 to 7 dpf, *itga8* mutants exhibit defective craniofacial phenotypes, including reduced ceratohyal angle, symplectic length, and distance between the two junctions of meckel's cartilage and palatoquadrate. Further, approximately 20% of mutants display symplectic and ceratohyal fusion. Bulk RNA expression analysis identified alterations in the expression of genes that are associated with osteoclast differentiation, bone mineralization, and chondrocyte proliferation. Our study identified that Itga8 regulates facial bone morphogenesis by modulating genes that induce osteoclast differentiation, bone mineralization, and chondrocyte proliferation (Figure 12).



Facial cartilage and bone in zebrafish larvae: Pharyngeal skeleton of 6 days old zebrafish larva stained for bone (A, B) and cartilage (D) with alizarin red and alcian blue, respectively. Distinct bony and cartilaginous elements are distinguishable in the stained embryos, which can be comparable with the schematic representation of different bone elements (C) and cartilage (E)

Abbreviations: BB, Basibranchial, CH, ceratohyal, MC, Meckel's cartilage, SY – symplectic, PQ, palatoquadrate; ET – Entopterygoid, PS – Parasphenoid, BSR – Branchiostegal ray, OP – Opercle, OL – Otoliths, T – Teeth, CT – Cleithrum, NC – Notochord.

Figure 12 Cartilage and bone staining

Non-autonomously regulated autophagy in *Drosophila*

Cell-cell communication is one of the most fundamental evolutionarily conserved biological phenomena observed in metazoans. It is crucial not only for the execution of several aspects of cellular behaviour, including cell division and motility, but also for maintaining tissue homeostasis. Macroautophagy is a conserved mechanism that degrades toxic protein aggregates and damaged organelles within the cytoplasm to maintain homeostasis. Autophagy has been considered and mostly studied as a cell-autonomous mechanism in metazoans. However, the regulation of autophagy in cell non-autonomous manner is poorly studied. Non-autonomously regulated autophagy involves degradation of autophagic components, including toxic proteins and organelles, and is induced in neighbouring cells by signals from primary cells within tissues/organs or distant cell types in different tissue/organ.

To address this question, we utilise the Drosophila female germline stem cell (GSC)-niche as a model tissue. The niche cells (the terminal filament cells, cap cells and escort stem cells, escort cells) control several aspects of germline stem cell behaviour, including the maintenance, differentiation and death of GSCs by paracrine signalling and maintaining physical contact through adherens-junctions proteins (juxtacrine signalling). Thus, the GSC-niche of Drosophila is an excellent model tissue to study cell non-autonomous regulators of autophagy (Figure 13).

We have identified the potential paracrine signals and membrane-bound proteins expressed in the niche cells in Drosophila using *in-silico* techniques such as GO (gene ontology) search and comparative data analyses from published literature. These candidate genes were ranked according to the expression levels and selected based on their novelty (new protein) or novelty of function (e.g. membrane-bound enzyme). Several potential candidates exhibit autophagy phenotypes in GSCs when knocked down in the niche cells. For instance, a candidate gene belonging to BMP signaling pathway was knocked down (using RNAi technique), and the upregulation of autophagy was observed in the GSCs.

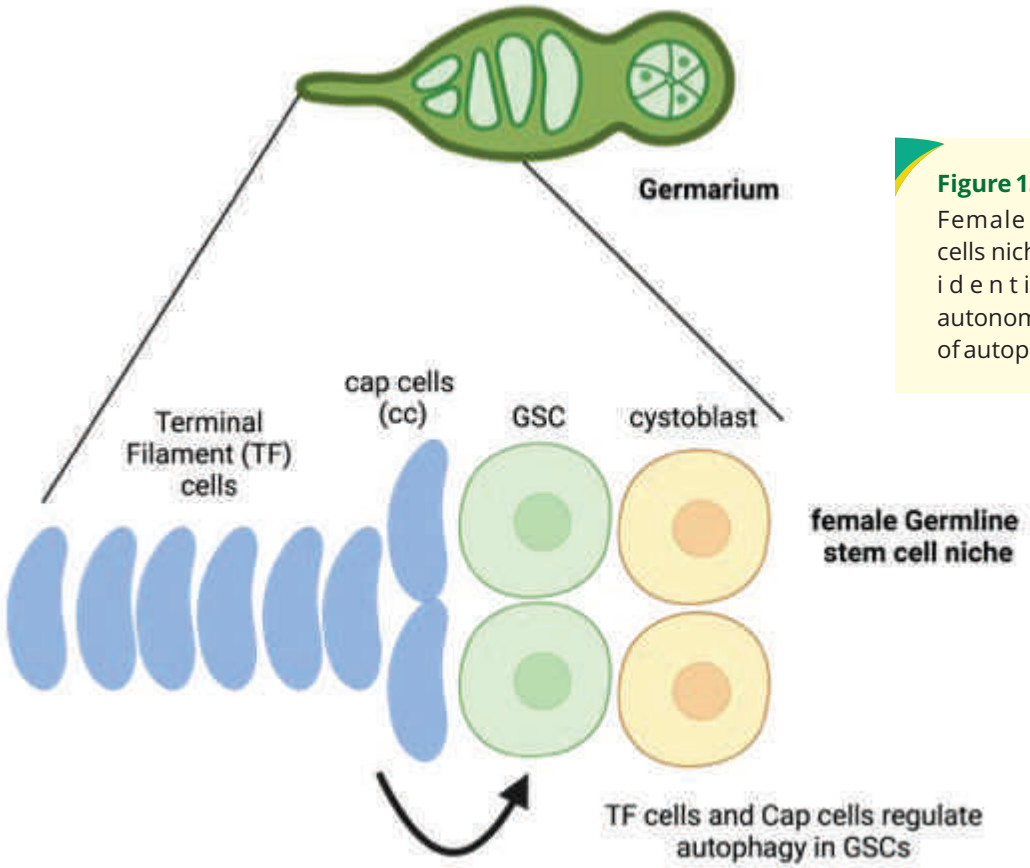


Figure 13
Female germline stem cells niche and strategy to identify cell non-autonomously regulators of autophagy

Diagrammatic representation of Drosophila germarium. The expanded view shows niche cells like Terminal filament (TF) cells and Cap cells (CCs). TF cells and Cap cells control GSC behavior. Cystoblasts are daughter cells of GSCs which have entered differentiation programme.

Genetics & Plant Breeding

ARI is engaged in improving the productivity and profitability of crops on an ecological and economically sustainable basis. It 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 on crop biology. Development of functional markers using this information is ongoing which may help in breeding next generation crop varieties.

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

We aim to deliver newer versions of well adapted high yielding varieties as well as new improved genotypes combining superior grain quality and rust resistance with the 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, breeding lines with 3 genes were advanced to the F6 stage during the season 2023-24. About 69 breeding lines with improved rust resistance and morphological traits were evaluated for agronomic traits. Wheat lines carrying high degrees of rust resistance will serve as a valuable genetic resource in wheat improvement programme.

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-1 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 along with the wild MACS 6478 genotype. The harvest was analyzed for agronomic, physiochemical, and end-use quality traits. Mutant lines 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. 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. Allele specific primers for these identified null HMW-GS mutants were developed. Their allele specificity was confirmed, and these primers will be useful in future marker-assisted breeding. The single HMW-GS mutants were pyramided and triple null for HMW-GS lines in the MACS 6478 background were developed. The triple null lines biscuit making quality testing is underway.

To study the effect of 1B/1R translocation on gluten protein composition and content

The 1BL/1RS (*Glu-B3-/Sec-1+*) translocation is widely used for enhancing wheat yield potential, as well as rust and mildew resistance, and adaptability. However, this technique can result in some quality concerns, including decreased dough strength and increased dough stickiness. These issues are caused by the presence of secalins - monomeric rye endosperm storage proteins - coded by the *Sec-1* loci on 1RS. As a result, there is a decrease in dough strength and increase in dough stickiness.

Therefore, to overcome this problem we have developed lines with modified 1BL/1RS (*Glu-B3+/Sec-1-*) translocation in the background of MACS 2496 and MACS 6222, which carry 1BL/1RS (*Glu-B3-/Sec-1+*) chromosomes in which removal of *Sec-1* loci and addition of *Glu-B3* loci was done. These lines along with parents were sown in RBD with three replications for two years. Agronomic, protein and quality parameters analysis revealed that the lines developed showed similar grain yield and grain protein content. RP-HPLC data showed that the developed lines had similar alpha/beta, gamma gliadins and HMW glutenins contents over the years. Overall the omega gliadins content of developed lines was significantly reduced while LMW glutenin content was significantly increased in the developed lines as compared to recipient parents due to introgression of *Glu-B3* and removal of *Sec-1*. These developed lines also showed higher bread loaf volumes as compared to recipient genotypes. This shows the introgression of Glu-B3 and removal of Sec-1 loci will not affect the total grain protein content and grain yield. However, addition of Glu-B3 will increase LMW glutenin content and bread loaf volume by increasing total gluten strength of the dough.

Alternative dwarfing genes for improvement of early vigor 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. Advanced backcross breeding lines developed through marker-assisted introgression of *Rht14* and *Rht18* in Indian wheat varieties were sown in the field under deep-sown conditions for evaluation of crop emergence and agronomic traits. Advanced breeding lines with longer coleoptile, seedling vigour and improved emergence traits were identified. The lines showed improved harvest index, yield and other agronomic traits under deep-sown conditions.

Genomic signatures associated with pollen sterility in the seedless mutant of grapevine

Seedless grapes are in high demand for fresh and dry fruit consumption. Seedlessness in grapes (*Vitis vinifera* L.) is triggered by stenospermocarpy and parthenocarpy. However, the key regulators of seed development and their targets in grapes are not well characterized. In the present study, the seeded grape hybrid ARI 516 and its seedless mutant were used to understand the molecular mechanisms controlling the seedless phenotype in grapes. Transcriptomic comparisons were performed during three developmental stages to study altered developmental processes in the seedless mutant and ARI 516. Genes downregulated in the seedless mutant were enriched in the male gametophyte development-related pathways which may be the cause of pollen sterility. Genome sequence data revealed homozygous and heterozygous InDels in the genes related to male gametophyte development. Pollen sterility detected in the seedless mutant was likely attributable to the differential expression and InDel mutations identified in the genes involved in cell division, male gamete differentiation, development, nourishment, and maturation. This study represents a comprehensive attempt to identify putative candidate genes associated with parthenocarpic pollen sterility in grapes using genomic approaches.

Breeding for high-yielding elite soybean cultivars with climate/disease resilience and end-use quality traits by multi-parent hybridization and genomic-assisted selection

We made two-way crossings in 24 distinct founder lines in the development of ARI Soybean MAGIC population, resulting in 1560 F_1 seeds. These founder lines were selected based on 198 soybean accessions cluster analysis using GBS-ddRAD data and trait-specific surrogate accessions. In Kharif 2023, phenotyping was done at two locations (Hol and Songaon farm) using randomized block design experiments. The data collected will be utilized for GWAS analysis to identify variables associated with soybean domestication, yield, oil and protein content, fatty acid composition, plant architecture, and traits related to salinity tolerance.

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 coordinated through IIWBR Karnal. ARI wheat breeding programme targeted four agro-ecosystems viz., rainfed, irrigated full fertility, restricted irrigation, and late sown for the development of wheat varieties in all the three species. Production of breeder seed, and demonstration of latest technology of wheat production on farmer's fields was done.

ARI station wheat research and activities

Development, selection and advancement of breeding lines: We generated 120-160 parental cross combinations which will be screened for hybrid vigour and true F1 behaviour. The breeding materials of

787 cross combinations representing as lines/bulk from different segregating generations of F_2 to F_6 were screened and selected based on traits and objectives.

Station trials for yield: We conducted sixteen station trials for yield evaluation. A total of 610 entries developed from institutional research, material selected from international nurseries and collaborative projects were being evaluated for yield performance. From these trials, we have promoted 35 entries to the IPPSN trial. A similar number of trials and entries were planted in the current year.

Disease evaluation: All the breeding materials were screened and evaluated for leaf rust, stem rust and leaf blight. Rust spores were artificially inoculated, injected and sprayed for five to seven times to maintain appropriate disease intensity.

ICAR-AICRP Wheat

Breeding trials: Total 154 entries from different parts of India were planted and evaluated. Sixteen ARI wheat lines advanced in the nationally coordinated trials. Eight and 13 wheat entries from MACS-ARI are being evaluated in the AVT & NIVT, respectively. Based on three years of yield and disease data from station trials, 35 new wheat entries developed at ARI were promoted to IPPSN. Promising entries from these will enter the national level multilocation trial for the next three years.

Pathological trials: A total of 3362 entries were evaluated for different diseases including leaf rust, stem rust, leaf blight and other minor diseases. Through analysis and selection criteria the previous year's trials were concluded with resistant and susceptible entries.

Agronomy trials

Performance of new wheat genotypes at different dates of sowing under irrigated conditions: Sowing wheat on time generally results in a slightly higher yield compared to late sowing. One of the test varieties MP 1378 performed well with timely and late sowing, close to the best-performing varieties HI 8826 and GW 322.

Performance of new wheat genotypes under restricted irrigation conditions: Irrigation plays a significant role in yield enhancement. Applying two irrigations resulted in the highest grain yield compared to one or no irrigation.

Efficacy of herbicides against diverse weed flora of wheat: Effective weed control can be achieved with the pre-emergence application of Pyroxa + metsulfuron, which has shown the best results in terms of yield and biomass and to maintain a weed-free field.

Effect of nano urea on increasing nitrogen use efficiency and productivity of wheat under irrigated conditions: Regarding nitrogen application, standard practices are as effective as using nano urea. Recommended nitrogen application methods helped to achieve high yields.

Effect of NPK solubilizing microbial (Rhizosphere) consortium on wheat productivity under irrigated conditions: Combining 100% recommended NPK with BioNPK seed treatment proved to be most effective for maximum grain yield.

Wheat Breeder Seed Programme: Breeder seed (193 quintal) was distributed to seed agencies (Mahabeej, NSC, KSSC), seed industries, Farmers' Producers Organisations and the farmers. The seed will reach approximately 1.5-2.0 lakh ha in Peninsular India (Maharashtra and Karnataka). Nucleus seed and breeder seed production programme was done at Hol, Songaon farm and in farmers' fields (Figure 14).

Figure 14 Joint inspection of Wheat Breeder Seed at Songaon farm

Germplasm characterization and trait discovery in wheat using genomics approach and its integration for improving climate resilience, productivity and nutritional quality

Diverse germplasm accessions of 3148 were evaluated along with the core set of 500 and 600 new germplasm. The pooled analysis of data revealed some accessions with high adaptability and stable genotypes. The elite lines selected across different traits, including stress tolerance indexes, physiological traits (NDVI, CT, Biomass) and yield stability traits suitable for drought stress tolerance, were compiled and constituted as the new traits. The accession with the desirable traits for drought tolerance mechanisms and stable yield performance were re-evaluated in the current year. The best lines will be selected for further evaluation. Some of the identified lines with trait values for drought tolerance mechanisms were included in the crossing block to derive new breeding lines.

Enhancing Wheat Drought Tolerance: Cost-Effective Root Architectural Phenotyping at Seedling Stage

To employ the robust and cost-effective technique for screening and precise quantification of seedling stage, RSA traits in diverse wheat lines was assessed. Moderate positive correlation (r=0.52) between secondary root angle (SRA) and primary root angle (PRA) implies that changes in the PRA are accompanied by similar changes in the SRA. The negative correlation (r= -0.22) between PRA and total root length (TRL) indicates as PRA becomes steeper, the TRL tends to decrease, and vice versa. Weak negative correlation (r=-0.06) between RWC at grain filling under drought (DtRWCGf) and PRA revealed the significant diversity in RSA traits among wheat genotypes.

This study underscores the importance of harnessing innovative phenotyping methodologies, such as the modified clear pot method (MCPM), to explore and utilize RSA diversity to establish the relationship with drought response data from the field trials.

Accelerating genetic gains in maize and wheat for improved livelihood

The analysis concluded from the previous year's field evaluation of 120 entries and selected 7 best high-yielding entries from the AGG project (SABWGPYT_ TPE3_ Trial 7 & 8). These are promoted to advanced station yield trials and also utilised in the crossing programme. Twenty-two entries from the CIMMYT selections from nurseries and yield trials are promoted to advanced station trials and five out of them are being used in the crossing programme. This year, we have planted 180 entries for field evaluation. The selected genotypes from the multilocation trials of this programme will be tested in the national pipeline of the variety release from the 2023-24 cropping season.

Dissection of diversity and complex mechanism of Bipolaris sorokiniana infections in wheat using ToxA-Tsn1 interaction

The host-pathogen interactions between wheat and fungal pathogen *Bipolaris sorokiniana* are being evaluated. The whole genome sequencing of 10 isolates of *B. sorokiniana*, and phenotyping of the 500 wheat genotypes against spot blotch was completed. About 130 isolates of *Bipolaris* were collected from various locations.

Soybean Improvement

Soybean research at MACS ARI Pune comprises soybean crop improvement through conventional breeding techniques and biotechnological tools, agronomic evaluation of soybean elite entries and development of soybean production technologies, technology transfer through frontline demonstrations and production of quality nucleus and breeder seed production and supply to the seed multiplying agencies, to aid the seed mission of Department of Agriculture and Cooperation, Government of India. This programme has been fully sponsored by The Indian Council of Agricultural Research, New Delhi since 1968 and is being run as an All India Coordinated Research Project on Soybean.

Developmental soybean breeding programme

Hybridization and evaluation of breeding material

During Kharif 2023, seventeen promising varieties and breeding lines were sown in crossing blocks for hybridization to incorporate the desired improved trait to prevailing soybean accessions. The target traits were Earliness, High Yield, Null Trypsin, Null Lipoxygenase, Rust resistance, YMV resistance, Charcoal Rot Resistance, and Vegetable and Food grade type and National Hybridization Programme. The crossing and hybridization were carried out, and advancement in breeding material generation is in progress.

Evaluation of MACS Soybean Varieties in All India Co-ordinated Breeding trials

Soybean varieties developed at MACS-ARI, viz. MACS 1810 was tested in the Initial Varietal Trial (IVT) for yield and overall performance across the 31 Centres at all India levels; it ranked 2nd with a yield of 3133 kg/ha. Similarly, 'MACS 1834' an early maturing (101 days) soybean variety was tested in soybean early IVT trials and ranked 15th with a yield of 1731 kg/ha in the year 2023.

Evaluation of Elite Soybean Entries Developed through the Breeding Programme at MACS ARI Pune under Station trials

Breeding efforts led to the development of seventy elite soybean breeding lines, which were tested in four graded replicated trials. Of these, 8 lines gave significantly more yield than the highest yielding control (check) varieties KDS 726, DSb 34, MACS 1188 and MACS 1460. Out of these, three lines, MACS 1859, MACS 1831 and MACS 1884, gave seed yields of 3880, 3830 and 4109 kg/ha and were with 97, 97 and 89 days to maturity, respectively. These entries are proposed for the All India Coordinated Research Project's initial varietal trial (IVT) for all India evaluation during Kharif 2024.

Agronomic evaluation and development of soybean production technologies

A biofertilizer-based novel bioformulation was evaluated on soybean. It showed that the crop supplied with bio-formulation Rhizobium + MDSR14 + 12c along with 75% of the recommended dose of fertilizer (RDF) (3104 kg/ha) gave significantly higher seed yield of soybean over control (2259 kg/ha) and was closely followed by rest of the treatments. The yield obtained under the treatment containing Rhizobium + MDSR14 + 12c along with 75% RDF was on par with the 100% RDF. It would help to curtail the requirement of 25% recommended dose of fertilizers. In terms of economics, the treatment Rhizobium + MDSR14 + 12c along with 75% RDF was found remunerative in net returns and recorded maximum benefit-cost ratio (2.89:1) over the rest of the treatments.

An agronomic recommendation 'Rhizobium + MDSR14 + 12c along with 75% RDF is recommended to enhance soybean productivity by curtailing 25% recommended dose of fertilizer at the southern zone' was released at the 54th annual group meeting of ICARs All India Coordinated Research Project on Soybean.

Effect of herbicides and PGPR was assessed on soybean productivity during Kharif 2023, the result showed that the treatment combination of Weed-free check (2 hand weeding at 20 and 40 days after sowing (DAS) along with PGPR *Bradyrhizobium daqingense* @ 10 g/kg seed was found significantly superior in terms of yield (3709 kg/ha) and was followed by the treatment combination of Propaquizafop 2.5% + Imazethapyr 3.75% at 2.0 l/ha at 15-20 DAS and *B. daqingense* @ 10 g/kg seed (3455 kg/ha) over weedy check alone and in combination with PGPR.

The highest weed control efficiency (WCE) was observed in weed-free check- 2 hand weeding at 20 and 40 DAS (66.68%) followed by Diclosulam @ 26 g/ha + One hand weeding at 40 DAS (60.08%).

Technology transfer/ outreach programme and its socio-economic impact

To demonstrate the impact of improved production technology over the traditional practice of soybean cultivation, fifteen frontline demonstrations comprising recently released soybean varieties were conducted. The improved practice was able to bring 15.24% increase in soybean yield over the farmer's traditional practice, mostly due to sowing of improved soybean varieties MACS 1460 and MACS 1407 and technical advice on insect-pest management practices. The average yield under farmers' practice was 19.08 q/ha, while it was 22.00 q/ha with improved practice.

Soybean breeder and nucleus seed production

As a true and pure source of quality seed of soybean, a total of 146 quintals of breeder seed of soybean varieties MACS 1188, MACS 1281, MACS 1460, MACS 1407 and JS 335, has been supplied during Kharif

2023 to public and private seed multiplying agencies and farmers.

Similarly, 263.4 quintals of soybean breeder seed production were undertaken and will be supplied during the coming Kharif 2024 season. These seeds help contribute about 15-20% of the seed requirement of Maharashtra state. MACS soybean varieties contribute to a 9-lakh hectare (20.42%) area under the soybean crop in Maharashtra state (Figure 15).

Also, 15.04 quintals of nucleus seed of soybean varieties MACS 1188, MACS 1460, MACS 1520, MACS 1407, MACS 1281 and JS 335 has been produced which can be the source of seed for breeder seed production in kharif 2024.

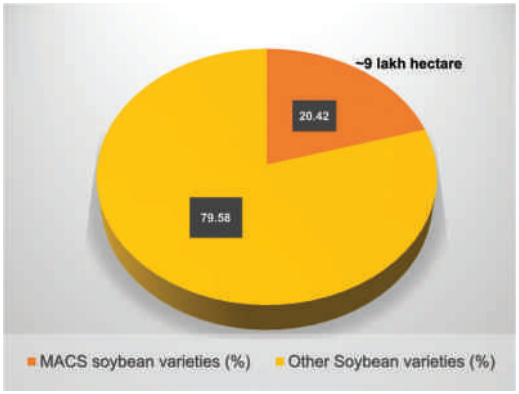


Figure 15
Contribution of MACS Soybean varieties in Maharashtra state

Soybean contract farming and collaborations for quality seed supply

Soybean breeder seed (194 quintal) of the varieties MACS 1188, MACS 1281, MACS 1407, MACS 1460 and JS 335 was produced.

Grape improvement

Fourteen cross combinations were attempted using six female parents and four seedless male parents, two black varieties Jumbo, Krishna seedless and two white varieties, SSN and, RK which are commercially used for developing table purpose seedless varieties with good quality attributes. Two-hundred and ninety-two berries were harvested and kept for chilling treatment for obtaining good germination. ARI germplasm contains 6 Vitis species, 62 cultivars of grape, six wine varieties, and 9 types of rootstocks maintained on their own root system.

Characterization of farmers' grape varieties and their facilitation for registration with PPVFRA

Farmers' varieties, which evolved over several years, exhibit proven unique traits. They possess stable characters compared to original varieties and have unique features. Most farmers' varieties of grapes are derived from Thompson seedless in white or Kishmish Cherni in black. Out of the total cultivated area under grape cultivation in India, more than 75% of the area is in Maharashtra. At present, there are five cultivars from the Sangli area which are to be registered with PPVFRA. These varieties are being characterized, and a database of farmers' varieties is being developed.

Grape growers develop new grape varieties but are unaware of their rights. Awareness of the farmers' rights for the protection of new varieties among grape growers is being created. A training cum awareness programme was held in Sangli in association with Maharashtra Rajya Draksha Bagaitdar Sangh.

Nanobioscience

The Nanobioscience group at ARI is engaged in research in several areas including development of organ-on-a-chip systems, nanomaterials suitable for applications in medicine, applications of nanomaterials in agriculture. A novel protozoal expression system was developed to improve efficiency, quality and versatility of protein production. Additionally, the diversity of methanotrophs and their application as single cell proteins were explored.

Synthesis of a new nanomaterial, development of scaffold and membrane for applications in 3D cell culture and organ-on-a-chip

Graphene was synthesized as a new nanomaterial. A low temperature synthesis approach was used for the synthesis of graphene from graphite. The material obtained was of high quality. Graphene was used in the development of a composite scaffold to enhance cell growth. Indeed, graphene served as an excellent material owing to its high surface area. The cells adhered to the graphene surface and more cell growth than control group was observed. Further, the scaffold was fabricated with a graphene-polymer composition and optimized. It was demonstrated that the scaffold fabricated from the composite of graphene, cellulose acetate and sodium alginate (GCA) was excellent for growth of cancer spheroids. Ovarian cancer cell line was used to grow spheroidal structures in the scaffold. Work on coculture of cancerous and normal cell lines in the scaffold is underway. Work is on to obtain the spheroids in perfusion mode.

Previously, a membrane was fabricated using PDMS keeping in mind the biocompatibility and elasticity. To impart selective permeability, lipids were used in the membrane fabrication. A composition of various lipids and PDMS was optimized to obtain a 25 µm thin membrane. The membrane is selectively permeable to molecules and impermeable to liquid. Further, the elasticity and biocompatibility are enhanced in the polymer-lipid hybrid membrane. Cells were cultured on both sides of the membrane. The membrane will be fabricated along with an alveolus on a chip device. The fabrication methodology is being developed.

Cyclic peptide BSBP8: a potential anti-amyloid therapeutic

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by β-amyloid peptide ($A\beta_{1-42}$) deposits, with no definitive therapies. Recently, cyclic peptides have been considered potential therapeutics because of proteolytic stability and tight and precise binding to $A\beta_{1-42}$ modified the classic cyclic peptide *viz.*, PPLeu, *via* a directed approach to arrive at a new β-hairpin cyclic peptide BSBP8 (MW 1450 Da), a potent anti-amyloidogenic agent. BSBP8 also disassembled pre-formed $A\beta_{1-42}$ fibrils and rescued neuronal cells from $A\beta_{1-42}$ induced cytotoxicity. In the Thioflavin T assay, BSBP8 showed ~82%

aggregation reduction when co-incubated with $A\beta_{1-42}$. Biophysical techniques, *viz.* Circular Dichroism, Fourier Transform Infrared Spectroscopy, and Atomic Force Microscopy substantiated these results. To achieve permeation of BSBP8 across the blood-brain barrier, the peptide was loaded onto poly D, L-lactide-co-glycolide nanoparticles (PLGA NPs). Compared to BSBP8 alone, the negatively charged (8.96 ± 1.22 mV) spherical particles with a mean diameter of 223.2 ± 3.52 nm, loaded with BSBP8 (2.86% w/w) permeated across the BBB formed by the Madin-Darby canine kidney cells. *In vivo* biodistribution profile indicated ~9%, 52% and 20% particle accumulation in the brain, liver, and kidney. Tissue retention of BSBP8-PLGA NPs was observed for at least seven days. It can be anticipated that this study will significantly promote the development of therapeutics for AD.

A nanoscale coating on dental implant surface that prevents peri-implantitis and improves osseointegration

Dental implants are being considered as an alternative to dentures especially for the individuals with loss of tooth/teeth early in life. Dental implants are successful in most cases, but in about 5% individuals, failures are attributed to peri-implantitis. The clinical success of implants depends on prevention of microbial infection immediately upon fixing the implant and rapid osseointegration. To this end new materials are being developed considering the increasing demand. Considering the antibacterial characteristics of cobalt (Co), we developed Co-deposited titanium ($Ti\text{-}Co_{15}$) using direct current (DC) sputtering and investigated it as a new material for implant dentistry. The material was characterized using atomic absorption spectroscopy, scanning electron microscopy-energy dispersive X-ray spectroscopy, and X-ray photoelectron spectroscopy. The material's surface topography, roughness, surface wettability, and hardness were also analyzed. The Co thin film ($Ti\text{-}Co_{15}$) showed excellent antibacterial effects against microbes implicated in peri-implantitis. Furthermore, $Ti\text{-}Co_{15}$ was compatible and favored the attachment and spreading of MG-63 cells (osteoblasts). The alkaline phosphatase and calcium mineralization activities of MG-63 cells cultured on $Ti\text{-}Co_{15}$ remained unaltered compared to Ti. These data correlated well with the time-dependent expression of ALP, RUNX-2, and BMP-2 genes involved in osteogenesis. The results demonstrate that Co-deposited Ti could be a promising material in implant dentistry (Figure 16).

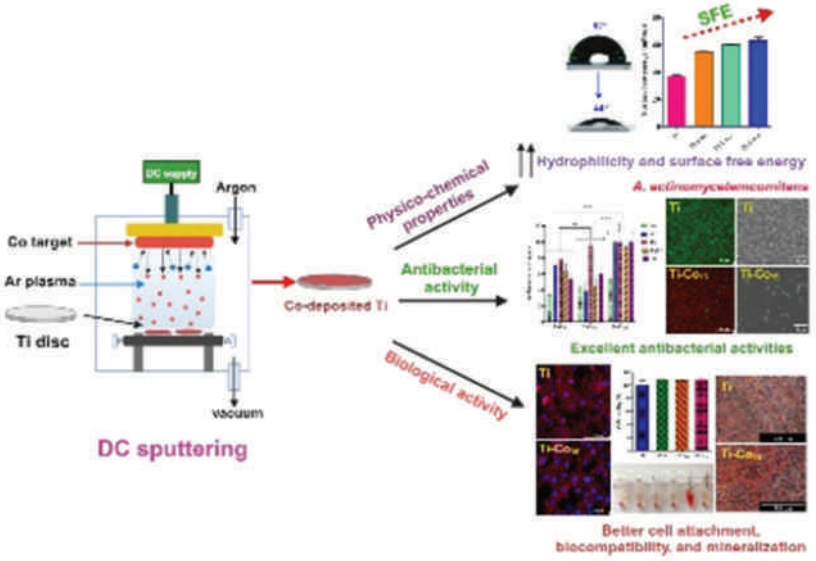


Figure 16
Schematic showing the process of surface modification of implant and its physico-chemical characterization and bioactivity

Acanthamoeba cells: a novel system for protein expression

The exploration of novel protein expression systems is driven by the ongoing quest to improve the efficiency, quality, and versatility of protein production. We studied the utility of the axenically culturable *Acanthamoeba* expression system as an alternative for the production of recombinant eukaryotic proteins. We developed plasmid vectors with TBP promoter to express recombinant proteins in the protozoan system. Further, we optimized the transfection protocols and demonstrated the expression of GFP, luciferase, and Chikungunya virus E2 protein in *Acanthamoeba* cells. Overall, our results suggest that protozoa are an excellent low-cost eukaryotic expression system.

MUC1 aptamer-tethered H40-TEPA-PEG nanoconjugates for targeted siRNA-delivery and gene silencing in breast cancer cells

With a prevalence of 12.5% of all new cancer cases annually, breast cancer stands as the most common form of cancer worldwide. We developed an aptamer-conjugated dendritic multilayered nanoconjugate for siRNA-based gene silencing in breast cancer. Initially, we transformed the hydroxyl groups of the hyperbranched bis-MPA polyester dendrimer into carboxylic groups. Subsequently, we linked these carboxylic groups to tetraethylenepentamine to form a positively charged dendrimer. In addition, the mucin-1 (MUC1) aptamer was attached to the dendrimer using a heterobifunctional polyethylene glycol. The targeted dendrimers exhibited no harmful effects on the NIH-3T3 fibroblast cells and RBCs, indicating their biocompatible characteristics. Confocal microscopy demonstrated significant higher uptake of targeted dendrimers than non-targeted dendrimers in MCF-7 breast cancer cells. The real-time PCR results demonstrated that the targeted dendrimers exhibited the most pronounced inhibition of the target gene expression compared to the nontargeted dendrimers and lipofectamine 2000. The caspase activation study confirmed the functional effect of survivin silencing by dendrimer, which led to the induction of apoptosis in breast cancer cells. The findings indicated that Mucin-1 targeted hyperbranched bis-MPA polyester dendrimer carrying siRNA could successfully suppress the expression of the target gene in breast cancer cells.

GLUT1 transporter-facilitated solid lipid nanoparticles loaded with anti-cancer therapeutics for ovarian cancer targeting

The standard therapy for ovarian cancer still poses numerous pitfalls due to the irrational use of drugs affecting healthy cells. As an appealing approach, nanomedicine, particularly solid lipid nanoparticles (SLN), could revamp the therapeutic profile of anti-cancer agents. Given the extra-ordinary benefits, we developed anti-neoplastic (paclitaxel) drug-loaded SLN (PTX-SLN) and functionalized with N-acetyl-d-glucosamine (GLcNAc) (GLcNAc-PTX-SLN) to reduce the rate of proliferation, and growth, of ovarian cancer cells over-expressing GLUT1 transporters. Using GLcNAc modified form of SLNs, confocal microscopy, MTT assay, and flow cytometry study demonstrated higher cellular uptake and significant cytotoxic effect. Also, molecular docking results established excellent binding affinity between GLcNAc and GLUT1, complimenting the feasibility of the therapeutic approach in targeted cancer therapy. Following the compendium of target-specific drug delivery by SLN, our results demonstrated a significant response for ovarian cancer therapy.

Molecular authentication, metabolite profiling and in silico–in vitro cytotoxicity screening of endophytic *Penicillium ramusculum* from *Withania somnifera* for breast cancer therapeutics

In the present study, we isolated a potent endophytic fungus from the roots of *Withania somnifera*. The endophytic fungal strain was authenticated as *Penicillium ramusculum* SVWS3 based on morphological and molecular sequencing using four gene data and phylogenetic analyses. *In vitro* cytotoxicity studies unveiled the remarkable cytotoxic potential of the crude extract derived from *P. ramusculum*, exhibiting dose-dependent effects on MDA-MB-468 and MCF-7 cells. Caspase activation assay established the underlying mechanism of the crude extract depicting the activation of caspases 3 and 7, indicating the induction of apoptosis in MCF-7 cells. The findings collectively substantiate the anticancer activity of bioactive metabolites synthesized by *P. ramusculum* SVWS3. Hence, the endophytic *P. ramusculum* SVWS3 could be an authentic source for developing novel chemotherapeutic drug formulations.

Studies on the platelet activation and calcium store release by a topical hemostatic xerogel dressing that improved blood clotting

Uncontrolled blood loss or severe hemorrhage is a challenge that often causes death in both civilian and military settings and significant mortality before hospitalization. During severe hemorrhage the blood clotting pathway is inadequate for halting the blood loss. In such situations, hemostatic dressings have potential to halt the bleeding by inducing the clotting cascade through contact activation and promotion of platelet aggregation. Platelets play a major role in the clotting process through release of platelet activators, platelet shape change and aggregation. The role of a platelet membrane protein, protease activating receptor 1 (PAR1), was studied in response to a porous composite xerogel dressing incorporating silica nanoparticles and calcium. The xerogel dressing was characterized by scanning electron microscopy–energy dispersive x-ray spectroscopy and Fourier transform infrared spectroscopy. The composite displayed superior blood clotting (13.9-fold more) than the commercial

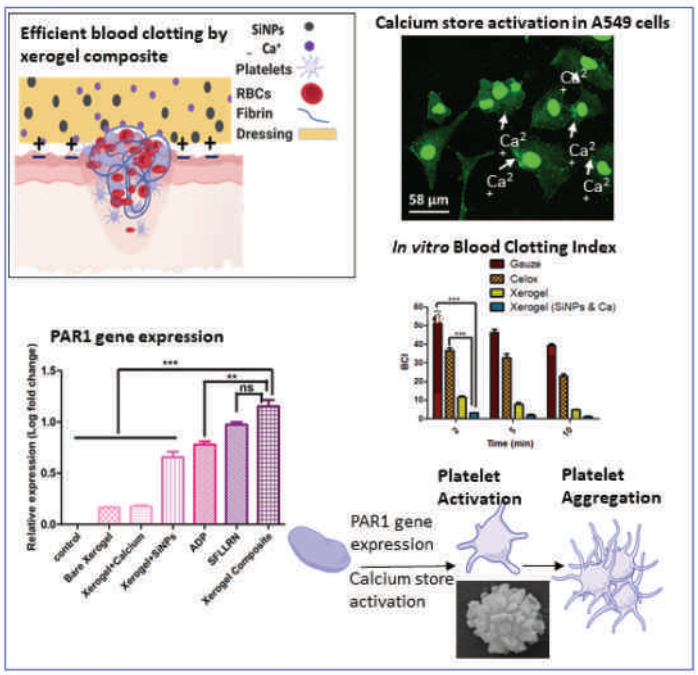


Figure 17
The topical hemostatic xerogel dressing improves blood clotting by platelet activation and calcium store release

dressing. The composite induced pseudopodia formation and increased platelet aggregation in comparison to bare xerogel, SFLLRN (a thrombin mimic), adenosine di-phosphate (a platelet activator), and heparin (a thrombin inhibitor). A significant upregulation of PAR1 on the platelet surface and calcium release were reported to play a crucial role in platelet shape change and aggregation. The hemostatic xerogel composite containing SiNPs and calcium enhanced blood clotting through activation of PAR1. Such dressings can provide a potential hemostatic solution to reduce blood loss, disability, and mortality during surgery and trauma care (Figure 17).

Nanocarriers mediated dsRNA delivery for gene silencing and biocontrol of *Helicoverpa armigera*

Helicoverpa armigera control, a lepidopteran insect pest has developed resistance to insecticides and transgenic Bt crops. There is a requirement for an alternative strategy. Specific gene silencing by RNA interference (RNAi) involving exogenous double stranded RNA (dsRNA) delivery has potential for targeting specific insects although it faces challenges of degradation and stability. In this study we synthesized cationic chitosan nanoparticles (CNPs, 95 nm size, +36 mV charge) that efficiently bound to dsRNA (95 %) and protected it from insect gut nucleases and pH degradation. The fluorescent tagged CNPs were found to be stable on leaf surface and were internalized by columnar insect gut cells. Ingestion of a single dose of CNPs:dsRNA complex (containing 0.1 µ g dsRNA) by *H. armigera* larvae via artificial/leaf feed effectively silenced lipase and chitinase target genes (2–2.7 fold downregulation) and suppressed their respective enzyme activities (2–5.3 fold). RNAi reduced insect pupation (5-fold) and impaired the emergence of moth. Administration of dsRNA showed a significant insect mortality (100%). Furthermore, specific dsRNA did not affect non-target insects like army worm and fruit flies. Developed CNPs:dsRNA complexes towards RNAi targets can serve as a safe, targeted insecticide for sustainable crop protection (Figure 18).

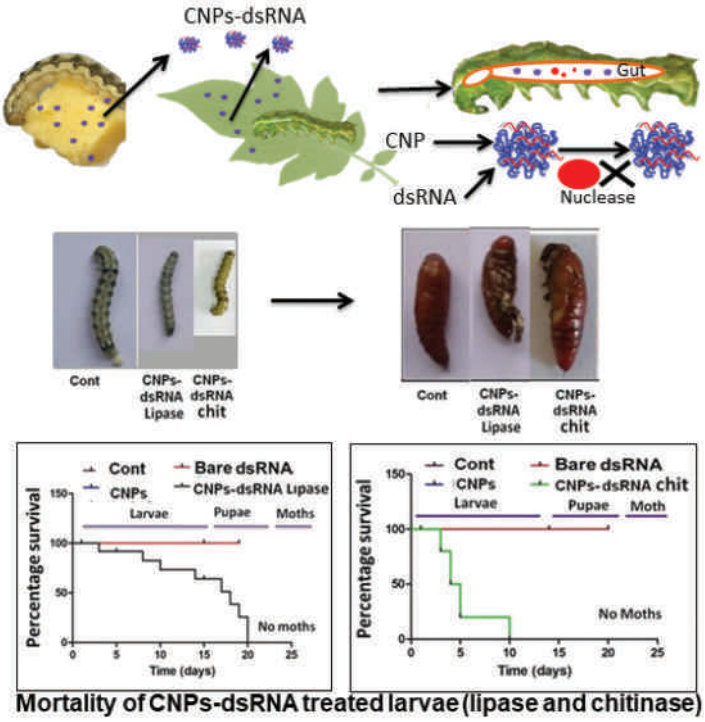


Figure 18
Administration of dsRNA with nanocarrier protects it and effectively downregulates targeted genes to cause insect mortality

Annexure

Repositories

Agharkar Herbarium at MACS (AHMA)

A barcode and QR code system is introduced. Around 100 accessions are provided with Barcodes and QR codes. Fifteen researchers outside ARI visited AHMA for herbarium studies. An educational visit from Jnana Prabodhini Prashala, with 70 students, was facilitated for study purposes, and necessary information about the Herbarium was provided. A visit of 40 M.Sc. students from the Department of Botany Savitribai Phule Pune University facilitated and provided necessary information about AHMA. 20 students from UG & PG Department of Botany, R.A. Arts, Shri M.K. Commerce, and Shri S.R. Rathi Science College, Washim, visited AHMA as a part of their academic visit.

Ajrekar Mycological Herbarium (AMH)

Ajrekar Mycological Herbarium holds 10688 exsiccate specimens, including 173 specimens received from different centers in India for deposit and accession during the period of the 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 (rats and mice) for trading purposes, and c) research for commercial purposes.

The facility has a 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 32 proposals, c) upgraded the facility by adding new advance equipment, d) performed 7 proposals on contract basis and 8 intra- and extra-mural projects, e) published and submitted 5 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, and h) developed animal models of various diseases to test various drugs and biologically active molecules

Crude Drug Repository

The Crude Drug Repository of Agharkar Research Institute maintains genuine/authenticated crude drug specimens of field/market samples of crude drugs. It also provides identification/authentication services for crude drugs, pharmaceuticals, researchers, students, etc. Presently, the repository hosts more than 1800 specimens of plant parts used as/ in medicine collected from the field and or market.

Diatom Collection

The diatom collection contains approximately 4750 samples from the present day to the Pleistocene period. Currently, the culture collection comprises 300 strains of the genus *Gomphonema* and 50 strains from other freshwater genera, including *Nitzschia*, *Pinnularia*, *Navicula*, and *Cymbella*. Additionally, the collection includes 20 strains sourced from marine environments.

Fossil Repository

The fossil repository hosts over 5000 fossil-type specimens of various animal and plant groups. Over 3000 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 of 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 mesophilic methanogenic archaea, and alkaliphilic cultures. Efforts over the past six months have been geared towards making MCM a world-class facility for anaerobic microbial cultures, including Archaea, Bacteria, and Fungi, along with aerobic bacteria. For this, reviving and synergizing the microbial resources available at MCM was the top priority. A streamlined quality management system is being developed using ISO-9001-based SOPs and work instructions to improve the accessibility, traceability, and security of microbial resources.

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 5740. The fungal germplasm is maintained in theculture collection by following standard long-term preservation methods, like freeze drying, distilled water, glycerol and liquid nitrogen. A total of 250 fungi were accessioned during period of report and 110 authentic fungal strains were supplied to various academia, research institution, and industry.

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 has an archive of the late Prof. S. P. Agharkar's literature. This archive includes book collections, rare back volumes,

periodicals, and reference works primarily in German. ARI library has print, online journals, and databases accessible on 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 Quillbot, Scite.ai, and Microsoft 365. These tools can streamline the research process, enhance productivity, and improve the quality of research outputs. 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 tabulated below.

Particulars	Total	Particulars	Total
Books/ Bound Volumes	30251	Maps and Atlases	569
Reference Books	1138	Microfilms/ Fischer	636
PhD Thesis	403	Annual Report	11
MSc/ MPhil Theses	97	Journal	55
ARI Reprints/ Articles	3851	Digital Collection/ Documents	3232

Services

Crude Drug Authentication

A comprehensive authentication process was undertaken on a total of 130 samples. Of these, 119 samples were provided by academic institutions. These samples likely encompassed a diverse array of materials, ranging from bark, root, stem leaf, or fresh whole plant. Additionally, 11 samples were submitted by industries, indicating the involvement of private enterprises in research and development activities. These samples could include raw materials, seeds, fruits, stems, and bark relevant to industrial processes and product development. The authentication of these samples serves to verify their authenticity and ensure compliance with quality standards and regulatory requirements within the industrial sector.

Fungal Identification by NFCCI

Fungal cultures and other samples received from academic, research institutions, and industry were authenticated/ identified (359 in all). Academic and research institutions (95) and private/ industries (23) in India benefited from various services of national facility for fungi.

Institutional Core Activities

Biodiversity & Palaeobiology

Plants & Diatoms BD-07 Diatom herbarium and culture collection
BOT-15 Digitizing AHMA
BOT-17 Repository of crude drugs, and authentication services

Fungi	MYC-02 National Facility – Repositories and service (NFCCI, AMH, and Identification Service)
Palaeobiology	BD-03 Modernization of fossil repository

Bioenergy

MIC-10 Microbial Culture Collection

Developmental Biology

ZOO-18 Identification and functional analysis of novel regulators during heart development and regeneration

Intellectual Property

Patents granted

A method for rapid isolation and purification of DNA. M Chaudhari, J Rajwade, K Paknikar. No. 434888

Astute footwear device with integrated sensors. D Bodas, P Kulkarni, A Jadhav, S Jadhav, P Inde, A Chaudhari, A Deshpande, A Zingade. No. 438851

3D porous scaffolds for cell culture and tissue engineering. D Bodas, V Kulkarni, K Paknikar. Patent No. 500353

Microchip-based portable real-time polymerase chain reactor. D Bodas, K Paknikar. Patent No. 508723

Nanocarrier is used for the delivery of an ensconced payload, the method of its preparation, and its applications. V Ghormade, V Gajbhiye, K Paknikar. Patent No 458152

Chitosan-Based Dressing For Rapid Hemostasis. Vandana Ghormade. No 435691

Patents applied

Biocides for control of sulphate reducing bacteria. S Gaikwad, S Pore, S Dagar, P Dhakephalkar, K Singh, H Negi, N Singh, Ravi. No. 202411007391

Endophytic *Penicillium setosum* SVWS1 derived anticancer compound. No.: 202421003897

Memorandum of Understanding

With	Purpose
GPS Renewables Pvt. Ltd., Bangalore, 19 May 2023	Bioethanol from biomass – Bamboo and rice straw
The Maharashtra Rajya Draksha Bagaitdar Sangh, Pune, 12 July 2023	Cooperation and exchange in Grape cultivation
National Biodiversity Authority, Chennai, 16 September 2023	Access and benefit sharing
FastSence Innovations, Pune, 14 September 2023	Up-gradation of the lateral flow assay technology for the detection of virus in clinical and non-clinical samples
PPVFR Authority, 7 December 2023	MACS SAKAS (MACS 6768) for registration under PPVFR Act, 2001
Ashoka University, Sonipat, 31 January 2024	Cooperation in biological sciences and technology
Venture Centre, Pune, 17 February 2024	IPR facilitation

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

Book Chapters

Borde M and Singh, SK. (2022) Prospects of Cordycepin and Polysaccharides Produced by *Cordyceps.* In: Rajpal VR. et al. (eds). *Fungal diversity, ecology and control management*. (Fungal Biology Ser.). Springer Nature Singapore Pte Ltd., p.93-106. (International Publisher)

Doley K, Singh SK, and Borde M. (2023). Role of Fungi in Eco-Safety and Warfare: 37-52. In. Applied Mycology for Agriculture and Foods: Industrial Applications. (Eds) Singh SK, Kumar D, Md. Shamim & Sharma R. *Applied Mycology for Agriculture and Foods: Industrial Applications*. Apple Academic Press, Inc. Co-published with CRC Press (Taylor & Francis), pp.552. eBook ISBN9781003369868.

Kadu M, Salve R, Gajbhiye KR, Choudhary RK, Gajbhiye V. (2023). Historical Perspectives and Advances in Phytonanotechnology. In (Eds. P. Kesharwani and V. Gajbhiye) *Advances in Phytonanotechnology for Treatment of Various Diseases.* CRC Press (ISBN: 9781003231721)

Kadu M, Salve R, Gajbhiye KR, Choudhary RK, Gajbhiye V. (2023). Nanoparticle-Mediated Plant Bioactives for Cardiovascular Disease. In: (Eds. P. Kesharwani and V. Gajbhiye) *Advances in Phytonanotechnology for Treatment of Various Diseases.* CRC Press (ISBN: 9781003231721)

Kumar A, Maurya VK, Susmita C, Chaurasiya U, Maurya DK, Singh SK. (2023). Environmental Factors and Plant–microbes (endophytes) Interaction: an Overview and Future Outlook. In: Solanki MK, Yadav MK, Singh BP, Gupta VK (eds). *Microbial Endophytes and Plant Growth: Beneficial Interactions and Application*. Academic Press, p. 245-257. (International Publisher)

Kumar D, Desai LJ, Bhanu C, Singh SK, Singh KP, Balasubramani N, and Sadalaxmi A. (2023). "Pre-Harvest Management of Aflatoxin Contamination in Groundnut Through Biocontrol Products: 217-246. In: *Applied Mycology for Agriculture and Foods: Industrial Applications*. (Eds.) Singh SK, Kumar D, Md. Shamim & Sharma R. Apple Academic Press, Inc. Co-published with CRC Press (Taylor & Francis), pp.552. eBook ISBN9781003369868.

Kumar D, Singh PN, Willer H, Sharma SK, Singh UB, Lagashetti AC and Husain R. (2023). Fungal Biofertilizers and Biopesticides and Their Roles in Sustainable Agriculture:165-216. In *Applied Mycology for Agriculture and Foods*. (Eds. Singh SK, Kumar D, Md. Shamim & Sharma R). Apple Academic Press, Inc. Co- published with CRC Press (Taylor & Francis), pp552. eBook ISBN9781003369868.

Kumar D, Singh SK, Arya SK, Srivastava D, Rajput VD and Husain R. (2023). Multifunctional growth-promoting microbial consortium-based biofertilizers and their techno-commercial feasibility for sustainable agriculture. In: *Microbiome Research in Plants and Soil Rhizobiome Ecology, Management and Application* (Eds) JA Parray, N Shameem, D Egamberdieva and R.Z. Sayyed. Academic Press (imprint of Elsevier), p. 167-197.

Rajwade JM, Kawle K. Kulkarni S, Kowshik M. (2023). Wound Treatment Using Nanomaterials. *Nanobiomaterials: Perspectives for Medical Applications in the Diagnosis and Treatment of Diseases*, *145*, 207-235.

Rajwade JM, Oak MD, Paknikar KM. (2024). Copper-based nanofungicides: The next generation of novel

agrochemicals. In *Nanofungicides* Kamel Abd-Elsalam (Ed). (pp. 141-168). Elsevier. https://doi.org/0.1016/B978-0-323-95305-4.00008-X

Rajwade JM, Kulkarni SS, Vanjari J. in Microbiome of Finfish and Shellfish. Arvind Diwan, Sanjay N. Harke, Archana Panche (Eds). Introduction to Finfish Microbiome and Its Importance. https://doi.org/10.1007/978-981-99-0852-3. Springer Singapore. Pages 3-33

Rajwade JM, Padhye A, Kulkarni SS. (2024) Two-Dimensional (2D) Materials for Bio-sensing Applications In. *Two-dimensional Hybrid Composites Synthesis, Properties and Applications*. eBook. N. Talreja, D. Chauhan, M. Ashfaq (Eds). https://doi.org/10.1007/978-981-99-8010-9. Springer Singapore. Pp 227-258.

Rana S, Kumar M, Maurya DK, and Singh SK. (2023). "Fungal Metagenomics: An Emerging Approach to Determine the Imperceptible Facets of Fungal Diversity:19-36. In: Singh SK, Kumar D, Md. Shamim & Sharma R (Eds.). *Applied Mycology for Agriculture and Foods*: Industrial Applications. Apple Academic Press, Inc. Co-published with CRC Press (Taylor & Francis), pp.552. eBook ISBN9781003369868.

Singh PN, Singh SK, Rana S, Lagashtti AC & Pawar KS. (2023). Progresses in Systematics of Bird's Nest Fungi (Cyathus), Preservation and Their Potential Significance. In: *Mycotalk*. (Eds. Vyas KM & Chandan Singh). AkiNik Publication® New Delhi, Pp30

Srivastava P and Dhakephalkar P. (2023). The Potential of *Terminalia chebula* Aqueous Extract in Plasmid Curing Activity against R-plasmids of Microorganisms. In: *Novel Aspects on Pharmaceutical Research* Vol. 3, Chapter 13. Print ISBN: 978-81-19217-99-1, eBook ISBN: 978-81-19217-92-2.

Thacker M. and Karthick B. (2024). A catalogue of Quaternary diatoms from the Asian tropics with their environmental indication potential for paleolimnological applications. The Role of Tropics in Climate Change, 295-375. https://doi.org/10.1016/B978-0-323-99519-1.00011-9

Monograph

Gupta N, Manoharachary C, Singh SK, Behera R and Mekro P. Fungi of Odisha. Part II. Regional Plant Resource Centre, Forest, Environment and Climate Change Department. Government of Odisha, Nayapalli, Bhubneshwar, p. 1-276

Book

Advances in Phytonanotechnology for Treatment of Various Diseases. Prashant Kesharwani, Virendra Gajbhiye. Publication date: 2023/9/29. Publisher: CRC Press. ISBN 9781032137469

Research Papers

Aboukhaddour, R; Hafez, M; McDonald, M; Moffat, CS; Navathe, S; Friesen, TL; Strelkov, SE; Oliver, RP; Tan, KC; Liu, ZH; Moolhuijzen, PM; Phan, H; See, PT; Solomon, PS. 2023. A Revised Nomenclature for *ToxA* Haplotypes Across Multiple Fungal Species. *Phytopathology*, 113 (7): 1180-1184. (Impact Factor = 4.01)

Avasthi, S; Gautam, AK; Verma, RK; Rajeshkumar, KC; Kumar, A. 2023. Fig Rust Caused by *Cerotelium fici*: Past, Present and Future. *Chiang Mai Journal of Science*, 50 (4):1- 19. (Impact Factor = 0.507)

Bhartiya, A; Rajesh, V; Aditya, JP; Jeevan, B; Gupta, S; Kant, L; Joshi, H; Mehtre, SP; Devi, HN; Jaybhay, S; Karnwal, MK; Nataraj, V; Khandekar, N. 2023. Evaluation of indigenous and exotic soybean accessions for yield, resistance to frog-eye leaf spot and yellow mosaic virus diseases. *Plant Genetic Resources-Characterization And Utilization*, 21 (6): 513-519. (Impact Factor = 1.279)

Borde, M; Singh, S. 2023. Enhanced production of cordycepin under solid-state fermentation of *Cordyceps militaris* by using combinations of grains/substrates. *Brazilian Journal of Microbiology*, 54 (4): 2765- 2772. (Impact Factor = 2.214)

Chaubey, RK; Thakur, D; Navathe, S; Sharma, S; Mishra, VK; Singh, PK; Chand, R. 2023. Heterologous expression and characterization of *ToxA1* haplotype from India and its interaction with *Tsn1* for spot blotch susceptibility in spring wheat. *Molecular Biology Reports*, 50 (10): 8213-8224. (Impact Factor = 2.742)

Crous, PW et al. 2023. Fungal Planet description sheets: 1478-1549. *Persoonia*, 50 : 158-310. (Impact Factor= 11.658)

Darshetkar, AM; Godbole, RC; Nadaf, AB; Choudhary, RK; Barvkar, VT. 2023. Typification of two names in Nothapodytes (Icacinaceae). *Kew Bulletin*, 78 (4): 653-658. (Impact Factor = 0.813)

Deore, KS; Dhakephalkar, PK; Dagar, SS. 2023. Phylogenetically and physiologically diverse methanogenic archaea inhabit the Indian hot spring environments. *Archives of Microbiology*, 205 (10): Article No. 332. (Impact Factor = 2.667)

Deshpande, P; Wankar, S; Mahajan, S; Patil, Y; Rajwade, J; Kulkarni, A. 2023. Bacterial Cellulose: Natural Biomaterial for Medical and Environmental Applications. *Journal of Natural Fibers*, 20(2): Article 2218623 (Impact Factor = 3.507)

Ebright, RH; Macintyre, R; Dudley, JP; Butler, CD; Goffinet, A; Hammond, E; Harris, ED; Kakeya, H; Lambrinidou, Y; Leitenberg, M; Newman, SA; Nickels, BE; Rahalkar, MC; Ridley, MW; Salzberg, SL; Seshadri, H; Theissen, G; Vandongen, AM; Washburne, A. 2024. Implementing governmental oversight of enhanced potential pandemic pathogen research. Journal of Virology, 98(4) (Impact Factor= 6.549)

Gadre, S; Manikandan, M; Chakraborty, G; Rayrikar, A; Paul, S; Patra, C; Patra, M. 2023. Development of a Highly In Vivo Efficacious Dual Antitumor and Antiangiogenic Organoiridium Complex as a Potential Anti-Lung Cancer Agent. *Journal of Medicinal Chemistry*, 66 (19):13481-13500. (Impact Factor = 8.039)

Gaikwad, SB; Mapari, SV; Sutar, RR; Syed, M; Khare, R; Behera, BC. 2023. In Vitro and in Silico Studies of Lichen Compounds Atranorin and Salazinic Acid as Potential Antioxidant, Antibacterial and Anticancer Agents. *Chemistry & Biodiversity*, 20(12). (Impact Factor= 2.745)

Gaikwad, SL; Pore, SD; Dhakephalkar, PK; Dagar, SS; Soni, R; Kaur, MP; Rawat, HN. 2023. *Pseudodesulfovibrio thermohalotolerans* sp. nov., a novel obligately anaerobic, halotolerant, thermotolerant, and sulfate-reducing bacterium isolated from a western offshore hydrocarbon reservoir in India. *Anaerobe*, 83: Article no. 102780 (Impact Factor= 2.837)

Gajbhiye, KR; Salve, R; Narwade, M; Sheikh, A; Kesharwani, P; Gajbhiye, V. 2023. Lipid polymer hybrid nanoparticles: a custom-tailored next-generation approach for cancer therapeutics. *Molecular Cancer*, 22 (1): Article no. 160. (Impact Factor = 41.444)

Hivarkar, SS; Vasudevan, G; Dhakephalkar, PK; Dagar, SS. 2023. Description of *Sporanaerobium hydrogeniformans* gen. nov., sp. nov., an obligately anaerobic, hydrogen-producing bacterium isolated from Aravali hot spring in India. *Archives of Microbiology*, 205(9): Article no. 305. (Impact Factor = 2.667)

Jagdale S, Narwade M , Sheikh A , Shadab M, Salve R , Gajbhiye V, Kesharwani P, Gajbhiye KR. 2023. GLUT1

transporter-facilitated solid lipid nanoparticles loaded with anti-cancer therapeutics for ovarian cancer targeting. *International Journal of Pharmaceutics*, 637. (Impact Factor = 5.8)

Joseph, N; Loganathan, J; Jangid, K; Nair, S. 2023. Spatiotemporal variation of microbial communities in surficial sediments of Cochin estuary, southwest coast of India. *Environmental Monitoring and Assessment*, 195 (12): Article No. 1440. (Impact Factor = 3.307)

Kamat, V; Dey, P; Bodas, D; Kaushik, A; Boymelgreen, A; Bhansali, S. 2023. Active microfluidic reactor-assisted controlled synthesis of nanoparticles and related potential biomedical applications. *Journal of Materials Chemistry* B, 11 (25): 5650-5667. (Impact Factor = 7.571)

Kamble, U; He, XY; Navathe, S; Kumar, M; Patial, M; Kabir, MR; Singh, G; Singh, GP; Joshi, AK; Singh, PK. 2023. Genome-wide association mapping for field spot blotch resistance in South Asian spring wheat genotypes. *Plant Genome*, 17 (1). (Impact Factor = 4.219)

Karpe, Y. 2023. Processing of the Hepatitis E virus ORF1 nonstructural polyprotein. *Frontiers in Virology*, 3.

Kapse, N; Pisu, V; Dhakephalkar, T; Margale, P; Shetty, D; Wagh, S; Dagar, S; Dhakephalkar, PK. 2023. Unveiling the Probiotic Potential of *Streptococcus thermophilus* MCC0200: Insights from In Vitro Studies Corroborated with Genome Analysis. *Microorganisms*, 12 (2): Article No. 347. (Impact Factor = 4.926)

Karthick, B; Yogeshwaran, M; Kociolek, JP. 2023. A new freshwater gomphonemoid diatom genus from India, with the description of a new species from the Eastern Ghats. *Phycologia*, 62 (5): 499-511. (Impact Factor = 3.088)

Katagade, V; Kandroo, M; Ratnaparkhi, A. 2023. Embryonic spatiotemporal expression pattern of Folded gastrulation suggests roles in multiple morphogenetic events and regulation by AbdA. G3-Genes *Genomes Genetics*. (Impact Factor = 3.542)

Kaushik, T; Dixit, V; Murugan, T. 2024. Morphology and molecular phylogeny of two new species of Psammophaga (Rhizaria, Foraminifera) from the west coast of India. *European Journal Of Protistology*, 92: Article No. 126035. (Impact Factor = 3.471)

Khairnar, BD; Jha, A; Rajwade, JM. 2023. Rationally designed cyclic peptides and nanomaterials as 'next-generation' anti-amyloid therapeutics. *Journal of Materials Science*, 58 (24): 9834-9860. (Impact Factor = 4.682)

Khairnar, BD; Padhye, A; Madiwal, V; Jha, A; Jadhav, SH; Rajwade, JM. 2023. Cyclic ß-hairpin peptide loaded PLGA nanoparticles: A potential anti-amyloid therapeutic. *Materials Today Communications*, 35: Article No. 106322. (Impact Factor = 3.662)

Kolge H, Kadam K, Ghormade V. 2023. Chitosan nanocarriers mediated dsRNA delivery in gene silencing for *Helicoverpa armigera* biocontrol. *Pesticide Biochemistry and Physiology*, 189. (Impact Factor = 4.7)

Korra, T; Navathe, S; Biradar, S; Chand, R.2023. Pathogenicity and infection behaviour of *Exserohilum rostratum* on wheat and associated collateral hosts. *Journal of Plant Pathology*, 105 (3): 695- 709. (Impact Factor = 2.643)

Kulikovskiy, MS; Thacker, M; Glushchenko, AM; Kuznetsova, IV; Iurmanov, AA; Karthick, B; Kociolek, JP. 2023. *Gandhia* gen. nov.-A New Diatom Genus with Unusual Morphology Split Off from the Genus *Navicula* Bory. *Plants*-Basel, 12 (23): Article No. 3941. (Impact Factor = 4.658)

Kulkarni, A; Shetti, R; Shigwan, BK; Smrithy, V; Datar, MN. 2023. The relationship between vegetation, plant functional diversity, and environment on rock outcrops in the Western Ghats, India. *Plant Ecology & Diversity*, 16 (1-2): 87-98.

Kumar, CMS; Jacob, TK; Devasahayam, S; Rajeshkumar, KC; Lad, SS; D'Silva, S; Geethu, C. 2023. *Metarhizium indicum*, a new species of entomopathogenic fungus infecting leafhopper, Busoniomimus manjunathi from India. *Journal of Invertebrate Pathology*, 198. (Impact Factor = 2.795)

Liu, SL et al. 2024. Fungal diversity notes 1717-1817: taxonomic and phylogenetic contributions on genera and species of fungal taxa. *Fungal Diversity*. (Impact Factor = 24.902)

Madiwal, V; Khairnar, B; Rajwade, J. 2024. Enhanced antibacterial activity and superior biocompatibility of cobalt-deposited titanium discs for possible use in implant dentistry. *Iscience*, 27(2): Article No. 108827. (Impact Factor = 6.107)

Madiwal, V; Rajwade, J. 2024. Silver-deposited titanium as a prophylactic 'nano coat' for peri-implantitis. *Nanoscale Advances*, 8. (Impact Factor = 5.598)

Mamgain, R; Swami, S; Sarkar, D; Srivastava, P. 2023. Design, Synthesis, and in vitro Biological Evaluation of ROS-Generating Phenanthridin-trione-Epoxide Conjugates as Agents against Mycobacterium tuberculosis. *Chemistryselect*, 8 (25): Article No. e202300416. (Impact Factor = 2.307)

Meili, CH; Jones, AL; Arreola, AX; Habel, J; Pratt, CJ; Hanafy, RA; Wang, Y; Yassin, AS; TagElDein, MA; Moon, CD; Janssen, PH; Shrestha, M; Rajbhandari, P; Nagler, M; Vinzelj, JM; Podmirseg, SM; Stajich, JE; Goetsch, AL; Hayes, J; Young, D; Fliegerova, K; Grilli, DJ; Vodicka, R; Moniello, G; Mattiello, S; Kashef, MT; Nagy, YI; Edwards, JA; Dagar, SS; Foote, AP; Youssef, NH; Elshahed, MS. 2023.Patterns and determinants of the global herbivorous mycobiome. *Nature Communications*.14(1) : Article No. 3798. (Impact Factor = 17.694)

Mohite, JA; Manvi, SS; Pardhi, K; Bahulikar, RA; Deshpande, S; Patange, S; Joshi, M; Kulkarni, S; Rahalkar, MC. 2023. Diverse type I and type II methanotrophs cultivated from an Indian freshwater wetland habitat. *International Microbiology*, 27: 607-614. (Impact Factor = 3.097)

Mohite, JA; Manvi, SS; Pardhi, K; Khatri, K; Bahulikar, RA; Rahalkar, MC. 2023. Thermotolerant methanotrophs belonging to the *Methylocaldum* genus dominate the methanotroph communities in biogas slurry and cattle dung: A culture-based study from India. *Environmental Research*, 228. (Impact Factor = 8.431)

Mohite JA , Khatri K, Pardhi K, Manvi SS, Jadhav R , Rathod S, Rahalkar MC. 2023. Exploring the Potential of Methanotrophs for Plant Growth Promotion in Rice Agriculture. *Methane*, 2: 361-371.

Narwade, M; Shaikh, A; Gajbhiye, KR; Kesharwani, P; Gajbhiye, V. 2023. Advanced cancer targeting using aptamer functionalized nanocarriers for site-specific cargo delivery. *Biomaterials Research*, 27 (1): Article No. 42. (Impact Factor = 15.863)

Navathe, S; He, XY; Kamble, U; Kumar, M; Patial, M; Singh, G; Singh, GP; Joshi, AK; Singh, PK. 2023. Assessment of Indian wheat germplasm for *Septoria nodorum* blotch and tan spot reveals new QTLs conferring resistance along with recessive alleles of *Tsn1* and *Snn3*. *Frontiers in Plant Science*, 14: Article 1223959. (Impact Factor = 6.627)

Nguyen, NTT; Chaudhary, RK; Tu, TQ; Chu, MH; Nuyen, QH; Do, HV; Tran, BT; Lee, J; Lee, C; Sy, TD. 2023. Pollen and Seed Morphology of *Cleome* Species (Cleomaceae) in Vietnam. *Sains Malaysiana*, 52(7): 1977-1984. (Impact Factor = 1.006)

Nischitha, R; Shivanna, MB. 2024. In-vitro and in-silico studies on plant growth promotion of endophytic fungi of *Ischaemum ciliare* Retz. *Journal of Plant Pathology*. (Impact Factor = 2.643)

Pandey, S; Choudhary, P; Gajbhiye, V; Jadhav, S; Bodas, D. 2023. In vivo imaging of prostate tumor-targeted folic acid conjugated quantum dots. *Cancer Nanotechnology*, 14 (1): Article No. 30. (Impact Factor = 7.917)

Pandit, GS. 2024. New lichens records from the plateaus of North Western Ghats, India (Part 1). *Nova Hedwigia*. (Impact Factor = 1.254)

Paraparath, SO; Rajkumar, S; Rajeshkumar, KC; Verma, RK; Gautam, AK; Narula, B; Wijayawardene, NN; Tibpromma, S; Karunarathna, SC. 2023. A phylogenetic reappraisal of *Excipulariopsis narsapurensis* in *Wiesneriomycetaceae*, *Tubeufiales*. *Phytotaxa*, 607 (5): 273-290. (Impact Factor = 1.05)

Pardhi, S; Kokila, T; Thacker, M; Alakananda, B; Karthick, B. 2023. Diatoms (Bacillariophyta) of the world's highest aquatic environments from the Western Himalayas, India. *Oceanological And Hydrobiological Studies*, 52 (2): 172-205. (Impact Factor = 0.829)

Patil, G; Pawar, R; Ghormade, V. 2024. Investigation of platelet activation and calcium store release by a topical hemostatic xerogel dressing for improved blood clotting. *Journal of Applied Polymer Science*, 141(14). (Impact Factor = 3.057)

Perween, N; Pekhale, K; Haval, G; Bose, GS; Mittal, SPK; Ghaskadbi, S; Ghaskadbi, SS. 2023. Glutaredoxin 1 from Evolutionary Ancient Hydra: Characteristics of the Enzyme and Its Possible Functions in Cell. *Biochemistry*-Moscow, 88 (5): 667-678. (Impact Factor = 2.824)

Perween, N; Pekhale, K; Haval, G; Khude, G; Ghaskadbi, S; Ghaskadbi, SS. 2023. Glutathione synthetase from *Hydra vulgaris*: Molecular cloning, overexpression, purification and partial characterization. *Protein Expression and Purification*, 208. (Impact Factor = 2.025)

Prasad, P; Thakur, R; Bhardwaj, SC; Savadi, S; Gangwar, OP; Lata, C; Adhikari, S; Kumar, S; Kundu, S; Manjul, AS; Prakasha, TL; Navathe, S; Hegde, GM; Game, BC; Mishra, KK; Khan, H; Gupta, V; Mishra, CN; Kumar, S; Kumar, S; Singh, G. 2023. Virulence and genetic analysis of *Puccinia graminis* tritici in the Indian sub-continent from 2016 to 2022 and evaluation of wheat varieties for stem rust resistance. *Frontiers in Plant Science*, 14. (Impact Factor = 6.627)

Radhakrishnan, C; Das, SK; Wetzel, CE; Karthick, B. 2023. *Adlafia kociolekii* sp. nov. (Bacillariophyceae): a new naviculoid diatom from the Eastern Himalayas, India. *Phytotaxa*, 595(1): 62-72. (Impact Factor = 1.05)

Radhakrishnan, C; Nayak, P; Williams, DM; Karthick, B. 2023. *Genkalia aravindia* sp. nov.: a new diatom (Bacillariophyta) associated with wet wall habitats from Eastern Himalayas and comments on the related genera. *Nova Hedwigia*, 117(1-4): 191-202. (Impact Factor = 1.254)

Rai, P; Ratnaparkhi, A; Roy, JK. 2023. Rab11 rescues muscle degeneration and synaptic morphology in the park13/ + Parkinson model of *Drosophila melanogaster*. *Brain Research*, 1861: Article No. 148442. (Impact Factor = 3.61)

Rajeshkumar, KC; Varma, RK; Sruthi, OP; Gautam, AK; Crous, PW. 2023. Groenewaldia (Lentitheciaceae), a new corticolous fungal genus from India. *Mycological Progress*, 22 (6): Article No. 43. (Impact Factor = 2.538)

Rana, S; Singh, SK. 2023. Insights into the genomic architecture of a newly discovered endophytic Fusarium species belonging to the *Fusarium concolor* complex from India. *Frontiers In Microbiology*, 14: Article No. 1266620. (Impact Factor = 6.064)

Salve, R; Kumar, P; Chaudhari, BP; Gajbhiye, V. 2023. Aptamer Tethered Bio-Responsive Mesoporous Silica Nanoparticles for Efficient Targeted Delivery of Paclitaxel to Treat Ovarian Cancer Cells. *Journal of Pharmaceutical Sciences*, 112(5): 1450-1459. (Impact Factor = 3.784)

Senanayake, IC et al. 2023. Fungal diversity notes 1611-1716: taxonomic and phylogenetic contributions on fungal genera and species emphasis in south China. *Fungal Diversity*, 122 (1): 161-403. (Impact Factor=24.902)

Shete, PA; Ghatpande, NS; Varma, ME; Joshi, PV; Suryavanshi , KR; Misar, AV; Jadhav, SH; Apte, PP; Kulkarni, PP. 2024. Chronic dietary iron overload affects hepatic iron metabolism and cognitive behavior in Wistar rats. *Journal of Trace Elements in Medicine and Biology*, 84. (Impact Factor = 3.5)

Sirvi, R; Soman, A; Borkar, VD; Kulkarni, KG. 2023. Reappraisal of stratigraphic position of a sandstone included in the Bagh Formation, exposed near Belam Bujurg, Khargone District, Madhya Pradesh, India. *Journal Of The Palaeontological Society of India*, 68 (2): 250-261. (Impact Factor = 0.652)

Smrithy, V; Kulkarni, A; Shigwan, BK; Porembski, S; Datar, MN. 2023. Desiccation-tolerant vascular plants from Western Ghats, India: review, updated checklist, future prospects and new insights. *Nordic Journal of Botany*, 2023 (5). (Impact Factor = 0.931)

Sridhar, A; More, AS; Jadhav, AR; Patil, K; Mavlankar, A; Dixit, VM; Bapat, SA. 2023. Pattern recognition in the landscape of seemingly random chimeric transcripts. *Computational And Structural Biotechnology Journal*, 21. (Impact Factor = 6.155)

Sukhramani, G; Choudhary, RK. 2023. Taxonomic Reconciliation of Smilacaceae in the Indian Subcontinent: Synonymy, Typification, Updated Inventory, and a Vegetative Key for Identification. *Phytotaxa*, 622(1): 42-62. (Impact Factor = 1.05)

Sukhramani, G; Maurya, S; Choudhary, RK. 2024. Plastome comparison reveals hotspots of nucleotide diversity and positive selection pressure on *accD, matK, psaA,* and *rbcL* genes in Smilacaceae. *Brazilian Journal of Botany*, 47(1): 145-161. (Impact Factor = 1.368)

Suryavanshi P; Bodas D. 2024. Knockout cancer by nano-delivered immunotherapy using perfusion-aided scaffold-based tumor-on-a-chi. *Nanotheranostics*, 8(3): 380-400.

Suryavanshi, P; Kudtarkar, Y; Chaudhari, M; Bodas, D. 2023. Fabricating a low-temperature synthesized graphene-cellulose acetate-sodium alginate scaffold for the generation of ovarian cancer spheriod and its drug assessment. *Nanoscale Advances*, 5 (18): 5045- 5053. (Impact Factor = 5.598)

Suthar, M; Dufossé, L; Singh, SK. 2023. The Enigmatic World of Fungal Melanin: A Comprehensive Review. *Journal of Fungi*, 9 (9): Article No. 891 (Impact Factor = 5.724)

Takahi, M; Taira, R; Onozuka, J; Sunamura, H; Kondow, A; Nakade, K; Nakashima, K; Sato, I; Hayashi, Y; Patra, C; Ohnuma, K. 2023. Xenograft of human pluripotent stem cell-derived cardiac lineage cells on zebrafish embryo heart. *Biochemical and Biophysical Research Communications*, 674: 190-198. (Impact Factor = 3.322)

Thacker, M; Kumaran, KPN; Hamilton, PB; Karthick, B. 2023. Appraisal of Asian monsoon variability in the Indian subcontinent and East Asia through the Quaternary using diatom records. *Earth-Science Reviews*, 247: Article No. 104622. (Impact Factor = 12.038)

Thakare, Y; Shelke, D; Sonawane, H; Ahire, S; Champaneria, P; Borde, M; Behera, B; Gaikwad, S. 2024. Molecular and metabolites characterisation of *Inonotus rickii*: a medicinal mushroom from Western Ghats of India and its biological activities. *New Zealand Journal of Botany*. (Impact Factor = 1.016)

Thite, S; Tarwadge, K; Mengade, P; Lodha, T; Joseph, N; Thakkar, L; Joshi, A. 2023. Taxogenomics of *Alkalihalobacterium chitinilyticum* sp. nov.: an alkaliphilic chitin degrading bacterial strain isolated from Lonar Lake, India, with potential biotechnological applications. *Antonie Van Leeuwenhoek*, 116 (11): 1103-1112. (Impact Factor = 2.158)

Tian, XG; Bao, DF; Karunarathna, SC; Jayawardena, RS; Hyde, KD; Bhat, DJ; Luo, ZL; Elgorban, AM; Hongsanan, S; Rajeshkumar, KC; Maharachchikumbura, SSN; Suwannarach, N; Dawoud, TM; Lu, YZ; Han, JJ; Xiao, YP; Du, TY; Lu, L; Xu, RF; Dai, DQ; Liu, XF; Liu, C; Tibpromma, S. 2024. Taxonomy and phylogeny of ascomycetes associated with selected economically important monocotyledons in China and Thailand. *Mycosphere*, 15 (1): 1-274. (Impact Factor = 16.525)

Ugale, V; Deshmukh, R; Lokwani, D; Reddy, PN; Khadse, S; Chaudhari, P; Kulkarni, PP. 2023. GluN2B subunit selective N-methyl-D-aspartate receptor ligands: Democratizing recent progress to assist the development of novel neurotherapeutics. *Molecular Diversity*. (Impact Factor= 3.364)

Vaidya, SP; Manikandan, M; Chhatar, S; Dey, S; Patra, C; Patra, M. 2023. A hydrolytically stable oxo-rhenium(v) antitumor agent for synergistic combination therapy with cisplatin: from synthesis and mechanistic studies to toxicity assessment in zebrafish. *Inorganic Chemistry Frontiers*, 10 (22): 6711-6727. (Impact Factor = 7.779)

Varghese, S; Jisha, MS; Rajeshkumar, KC; Gajbhiye, V; Haldar, N; Shaikh, A. 2024. Molecular authentication, metabolite profiling, and in silico-in vitro cytotoxicity screening of endophytic *Penicillium ramusculum* from *Withania somnifera* for breast cancer therapeutics. 3 Biotech, 14 (3). (Impact Factor = 2.893)

Varma, M; Ugale, V; Shaukat, J; Hollmann, M; Shete, P; Shravage, B; Tayade, S; Kumbhar, A; Butcher, R; Jani, V; Sonavane, U; Joshi, R; Lokwani, D; Kulkarni, P. 2023. Novel alkyl-substituted 4-methoxy benzaldehyde thiosemicarbazones: Multi-target directed ligands for the treatment of Alzheimer's disease. *European Journal of Pharmacology*, 957: Article No. 176028. (Impact Factor = 5.195)

Wadmare, N; van de Vijver, B; Karthick, B.2023. A critical analysis of the type material and taxonomic revision of the Indian Stauroneis acuta complex (Bacillariophyta) with the separation of two new species. *Nova Hedwigia*, 117 (1-4) : 351-380. (Impact Factor = 1.254)

Yogeshwaran, M; Kociolek, JP; Karthick, B. 2023. *Gomphonema rajaguruii* sp. nov., a new diatom (Bacillariophyceae) species from the Western Ghats, India. *Phytotaxa*, 595 (2): 199-208. (Impact Factor = 1.05)

Zehra, A; Dhondge, HV; Barvkar, VT; Singh, SK; Nadaf, AB. 2023. Evidence of polyamines mediated 2-acetyl-1-pyrroline biosynthesis in aromatic rice rhizospheric fungal species *Aspergillus niger*. *Brazilian Journal of Microbiology*, 54 (4): 3073-3083. (Impact Factor = 2.214)

Visits Abroad

Bodas D Prof. Dr. Felix Engel, University Clinic (availed Alexander von Humboldt Return Fellowship), Friedrich -Alexander-University, Erlangen, Germany, October–December 2023.

Datar MN International Workshop on Desiccation Sensitivity and Tolerance across Life Forms organized by the International Society of Seed Science, Johannesburg, South Africa, 15–19 January 2024.

Jangid K Multiple conferences organized in the field of microbial systematics and microbial resource centres, China, 30 October–9 November 2023.

Patra C Max-Planck Institute for Heart and Lung Research, Germany, 1 June-1 August 2023; Weinstein Cardiovascular Development and Regeneration Conference, San Diego, USA, 2–10 May 2023; Asian Conference on Fish Models for Diseases, Bali, Indonesia, 25 February-2March 2024.

Ratnaparkhi A 27th European Drosophila Research Conference, Lyon, France, 18–23 October 2023; 3rd Asia-Pacific Drosophila Neuroscience Conference, RIKEN, Tokyo, Japan, 27 February–1 March 2024.

Yogeshwaran M International Workshop on Phycology in the 21st Century, University of Colorado, Boulder, Colorado, USA, 9–22 July 2023.

Participation in Conferences/ Symposia/ Seminars/ Workshops/ Meetings

Biodiversity - Plants and Diatoms

Cheran R, Aravind NA, and **Karthick B** Sailing on the snails - Diatom Diversity Associated with Snails of Western Ghats, India. Molluscs of South Asia: Research, Conservation and Livelihoods - Commemorating the life and work of HH Godwain-Austin, Ashoka Trust for Research in Ecology and Environment, 11-13 December 2023.

Choudhary RK Indian Association for Angiosperm Taxonomy (IAAT), Calcutta University, Kolkata, 25-27 November 2023

Datar MN International Workshop, Desiccation Sensitivity and Tolerance Across Life Forms, Johannesburg, South Africa, 15–19 January 2024

Dwivedi A, Jadhav A, Karthick B and **Aravind NA** Elemental composition of shells from different genera of freshwater gastropods from India. Molluscs of South Asia: Research, Conservation and Livelihoods - Commemorating the life and work of HH Godwain-Austin, Ashoka Trust for Research in Ecology and Environment, 11-13 December 2023.

Karthick B Critical reflection session (Chintan Shivir) on reimagining education, organized by Kishore Bharati (KB) in association with the Indian Institute of Science Education and Research Pune, 25 March 2023; Workshop on Preprints in research assessment in India for stakeholders across academia, policy and funding bodies, India BioScience, 16 October 2023.

Kulkarni A Ecological Patterns and Drivers of Plant Diversity on Rock Outcrops in the Northern Western Ghats of India, 52 Annual Meeting of the Ecological Society of Germany, Austria and Switzerland, Leipzig, 12–16 September 2023

Pansare S and **Datar MN** In-vitro regeneration of important medicinal plant *Crinum* for conservation: Optimization and Establishment of bulb culture. Conference on Integrating Traditional Knowledge in Evidence-Based Medicine, Kharghar, Mumbai, 21 September 2023.

Biodiversity - Fungi and Lichens

Mapari SV Workshop, Molecular Docking: Study to predict interaction energy between molecules, 16–23 January 2024 (Online) and Training, MD Simulations: GROMACS, VMD & NAMD, BDG Lifesceinces (OPC) Pvt. Ltd, New Delhi, 9–15 February 2024 (Online); Bioinformatics Workshop, Centre of Bioinformatics Training and Research, Lucknow, 15–19 November 2023.

Maurya DK, Singh PN, and **Singh SK** Evaluation of antimicrobial activity of *Streptomyces* sp. isolated from *Bergenia ciliata* and identification of bioactive volatile compounds by GC-MS analysis. International Conference, Current emerging trends for advancement in commerce & science at global level, Ramsheth Thakur College of Commerce & Science, Kharghar, Mumbai, 8– 9 December 2023.

Nishchitha R Workshop, Molecular identification of microbial bioagents: Sequencing to phylogenetic analysis, ICAR-National Bureau of Agriculturally Important Microorganisms, Uttar Pradesh, 4–7 March 2024; Online workshop on Drug Discovery, Development, and Delivery, Codon Biosciences Pvt. Ltd. Goa, 20–25 November 2023; National Training Programme, Managing Science and Technology Projects, Institute of Public Enterprise, Hyderabad, 11–15 December 2023

Rana S and **Singh SK** International Conference, Biology, Biodiversity and Biotechnology of Fungi, Mumbai, 1–2 December 2023. (Award for Oral Presentation)

Rana S Hands-on Workshop, Molecular identification of microbial bioagents: Sequencing to phylogenetic analysis, ICAR-National Bureau of Agriculturally Important Microorganisms, Uttar Pradesh 4–7 March 2024.

Singh PN International seminar, Marine Fungi, MycoAsia-Journal of Modern Mycology, MycoIndia-Journal of Indian Fungi, Pondicherry University, 17 December 2023.

Singh PN, Pawar KS, and **Singh SK** Morphotaxonomic and phylogenetic studies on some Chromistan fungi of Order Saprlegniales from India," International Conference on Biology, Biodiversity, and Biotechnology of Fungi, Dept. of Botany, SIES, Mumbai, 1 – 2 December, 2023.

Suthar M and **Singh SK** International Conference, Biology, Biodiversity and Biotechnology of Fungi, Mumbai, 1-2 December 2023. (Award for best poster presentation)

Bioenergy

Dhanorkar A, Wagh S, Kapse N and **Dhakephalkar P** Unlocking the Potential of *Clostridium butyricum* ARI-I: Genomic Insights and Safety Assessment for Probiotic Applications. 7th International Conference on Recent Trends In Bioengineering, MIT-WPU, Loni Kalbhor, Pune, 19–20 January 2024.

Jangid K BISMiS Live: Connecting Microbial Systematists Across the Globe. Fifth Meeting of Bergey's International Society for Microbial Systematics, Guangzhou, China, 8 November 2023; Developing a molecular consensus between multiple phylogenies: A case study of the genus *Aeromonas*. Annual meeting of the World Data Centre for Microorganisms, Shenzhen, China, 2 November 2023.

Pisu V, Margale P, Chandras S, Kapse N, Shetty D, Wagh S, Dagar S, and **Dhakephalkar P** Exploring *Clostridium butyricum* B1: A Next-Generation Probiotic Candidate. International Conference on New Horizons in Biotechnology (NHBT-2023), NIIST, Trivandrum, Kerala, 26–29 November 2023.

Bioprospecting

Kulkarni P, Suryavanshi K and **Shete P** International Conference, Modern Trends in Inorganic Chemistry, Indian Institute of Sciences, Bengaluru, 14–17 December 2023.

Pansare S and **Gulavani S** First National Symposium, Integrating Traditional Knowledge in Evidence-Based Medicine, Advanced Centre for Treatment, Research and Education in Cancer, Tata Memorial Centre, Navi Mumbai, 21–22 September 2023.

Srivastava P and **Waghole RJ** LC-MSMS Qtrap-4500 training program, SCIEX Centre of Excellence, Bangalore, 9–12 January 2024.

Developmental Biology

Ayachit M An unconventional role of Autophagy related gene-1 in mitochondrial dynamics during *Drosophila* oogenesis at the Indian Drosophila Research Conference, IISER, Thiruvananthapuram, 6–9 December 2023.

Daware M 18th Capacity Building program organized at Indian Institute of public Administration, New Delhi-for technical personnels of Science and Technology Departments of Government of India, 25 September–6 October 2023.

Dwivedi V Role of Mon1 in regulating anterior-posterior patterning in Drosophila, Indian Drosophila Research Conference, IISER-Trivandrum, 6–9 December 2023.

Ratnaparkhi A 27th European Drosophila Research Conference, Lyon, France, 18–23 October 2023.

Selarka K BMP signaling negatively regulates autophagy during oogenesis in Drosophila, Indian Drosophila Research Conference, IISER, Thiruvananthapuram, 6–9 December 2023.

Kulkarni M Regulation of mitophagy in female germline stem cells of *Drosophila melanogaster*, Indian Drosophila Research Conference, IISER, Thiruvananthapuram, 6–9 December 2023.

Londhe R Workshop, HPTLC technique: Instrumentation, Regulatory Acceptance and its Applications in Phytochemical Analysis, 13 March 2024.

Shravage B Autophagy in the female germline of Drosophila, AIN 2024, Mumbai, 16–18 February 2024.

Genetics and Plant Breeding

Baviskar V Modelling and Assessment of Superiority of Wheat Varieties Tested under Farmers' Fields through Front Line Demonstrations in Semi-Arid Vertisols of India, 5th International Group Meeting on Climate-Proofing Cereal Agriculture: Strategies for Resilience and Sustainability, ICAR-Indian Institute of Wheat and Barley Research, Karnal, 28 March 2024.

Ghumatdar A Assessment of Seed Viability Vigour and Germination of Vegetable-type Soybean through Accelerated Ageing and Germination - Towel Paper Technique, National Students Poster Competition, Rajarshi Shahu College of Biotechnology, Latur, 27 February 2024 (Received 3rd Prize)

Ghumatdar A and **Jaybhay SA** Assessment of Seed Viability, Vigour and Germination of Vegetable type Soybean through Accelerated Ageing and Germination - Towel Paper Technique, International Conference, Innovations in Biotechnology Research for Sustainable Bioresources and Bioeconomy: Challenges and Practices, SRES's Sanjivani Arts, Commerce and Science College, Kopargaon, Ahmednagar, 15–16 February 2024.

Suresha PG Training program, Genomic Tools in Plant Genetic Resource Management, National Bureau of Plant Genetic Resources (NBPGR), New Delhi, 18–29 September 2023; ICAR-sponsored winter school on Use of Big Data Analysis in Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, 18 January–7 February 2024.

Tetali S 3rd Annual Maharashtra Rajya Draksha Bagaitdar Sangh grape, 28 August 2023.

Yashavanthakumar K An Examination of Wheat Grain Quality, Nutritional Characteristics, and Yield in Drought and Heat Stress Conditions Using Multiple Environments. 5th International Group Meeting on Climate Proofing Cereal Agriculture: Strategies for Resilience and Sustainability, ICAR-IIWBR, Karnal, 27–29 March 2024, (Best Poster)

Yashavanthakumar K and **Navathe S** Workshop and meeting, Accelerated Breeding Modernization to Enhance Genetic Gains in Crops, Nepal Agricultural Research Council, Kathmandu, Nepal, 1– 6 August 2023.

Yashavanthakumar K and **Baviskar V** 5th International Group Meeting, Climate-Proofing Cereal Agriculture: Strategies for Resilience and Sustainability, ICAR-Indian Institute of Wheat and Barley Research, Karnal, 28 March 2024.

Yashavanthakumar K, Baviskar V and **Navathe S** 62nd All India Wheat and Barley Research Workers' Meet, MPUAT, Udaipur, Rajasthan, 28–30 August 2024.

Jaybhay SA Recent Advances in Root Architectural Sampling and Monitoring Tools for Root Analysis in Rainfed Agriculture, ICAR Central Research Institute for Dryland Agriculture, Hyderabad, 24 January–2 February 2024.

Jaybhay SA, Idhol BD, and **Waghmare BN** Training programme, Climate Smart Production Technologies to Enhance Soybean Productivity under Changing Climate, ICAR Indian Institute of Soybean Research, Indore, 6–8 February 2024

Nanobioscience

Mayattu K and **Ghormade V** Mycocon 2023 and 5th International Conference on Fungal Infections, Pune, 9–10 September 2023.

Mohite J National Conference, Environmental Microbiology and Regulatory Aspects, ATMIYA University, 23 February 2024.

Padhye A 13th India-Japan Science and Technology Conclave: International Conference on Frontier Areas of Science and Technology, Shivaji University, Kolhapur, 8–9 September 2023.

Suryavanshi P and **Bodas D** Cellulose alginate scaffold: a standalone 3D cancer model, 4th ICGA Conference on Advancing Towards Integrated Precision Oncology, Indian Cancer Genome Atlas, IISER Pune, 6–8 October 2023.

Invited Talks

Karthick B Role of Diatoms in Securing Energy for Future in the Lifestyle for the Environment Webinar Series organized by IISc-EIACP [RP] and the Soaring Sparrows Foundation, 30 June 2023; Diatom and its application in biomonitoring for the MSc Wildlife Biology Class of the National Centre for Biological Sciences, Bangalore, 3 August 2023; An introduction to diatoms and their potential applications, Department of Environmental Science and Engineering, SRM University, AP, 24 August 2023; Diatoms Unveiled: Navigating Sustainable Development through the Lens of Biodiversity Assessment, International Conference on Knowledge for Sustainable Development: Dialogues across Disciplines to Implement Sustainable Development Goals, University of Hyderabad, 19 January 2024

Choudhary RK How I grew to be a Scientist, PhD Coursework, Science College, Nanded, 13 April 2023; Seven lectures on 'Molecular taxonomy' for MSc students, SP Pune University, Pune Recent Trends in Plant Taxonomy, online refresher course for college teachers, University of Mumbai, 9 June 2023; From DNA to Diversity: Genomics-Driven Insights into Plant Taxonomy, National level conference, Goa University, Goa, 26 October 2023; Revisiting the taxonomy of Smilacaceae in the Indian subcontinent using morphological and molecular tools, Indian Association for Angiosperm Taxonomy (IAAT), Calcutta University, Kolkata, 25 – 27 November 2023; SERB-supported National Seminar titled 'Phytochemistry and Molecular Taxonomy of Flowering Plants', Vimala College, Thrissur, Kerala, and delivered a keynote address on the topic ''Molecular Tools: Catalysts for Modernizing Plant Taxonomy" 18 January 2024.

Datar MN History of Plant taxonomy, Annasaheb Magar College, Hadapsar, 19 April 2023; Adaptation of plants on cliffs, Jividha, Pune, 14 June 2023; Rock outcrops as a wonderland of Western Ghats: Unravelling the flowering plant diversity, endemism, and adaptations (Online), Conference of Association of Tropical Biology and Conservation, 4 July 2023; From Tradition to Science: Unravelling the History and Research of Desiccation Tolerant Plants in India, Workshop The diversity of rock outcrop plant strategies in a changing world, University of Rostock, Germany, 18 July 2023(online); Invasive and alien plant species of Maharashtra, program organized by Maharashtra State Forest Department, 4 December 2023, Ram Hattikudur Advance Training in Conservation programme, 29 January 2024; Nurturing Nature's Remedies: Overcoming Hurdles in Medicinal Plant Cultivation, in Conference Integrating Traditional Knowledge in Evidence-Based Medicine, Kharghar, Mumbai, 22 September 2023 Dr. PN Deshmukh Memorial Talk, Ratnagiri, 6 February 2024.

Ghormade V Nanotechnology: Basics and applications, at the Refresher Programme in Life Sciences organized by the UGC-Human Resource Development Centre, SPPU, Department of Microbiology, 12 December 2023; Smart nano mediated detection of human pathogens and toxins" at International Conference on Recent Advances in Bio-Nano Composites for Enhancing Human Health at Gulbarga University, 8 January 2024

Jaybhay SA Soybean crop, its sowing, and overall management during the Pre-Kharif Planning program organized by the Agriculture Department of Govt. of Maharashtra at Hol, Taluka Baramati, District Pune, 8 June 2023; Soybean Lagwad v Vyavsthapan at Pusane Tal Maval Dist. Pune on an occasion of Krishi Sanjivani Saptah organized by the Department of Agriculture, Govt. of Maharashtra, 26 June 2023.

Navathe S Unraveling the Genomic Mysteries of Plant Pathogenic Fungi: A Comprehensive Study through Whole Genome sequencing, MycoIndia World Fungus Day 2023 Lectures, 1 October 2023; Talk in the Modern Mycology Lecture Series Jointly organized by CBEC and Mycoasia on topic Genome Analysis of Fungal Pathogens of Cereal Crops, 3 February 2024.

Patil R Talk on QTL mapping using structured populations at College of Agricultural Biotechnology, Loni, 28 March 2024.

Patra C Faculty Development Program 2023, Dept. of Pharm. Technology, JIS University, India, 27 September 2023; National Seminar on "Recent Trends in Biology", Department of Zoology, SP Pune University, 12 – 14 October 2023; International Conference on Cellular and Molecular Mechanisms of Development and Regeneration 2024, Shiv Nadar University, New Delhi, 15 – 18 February 2024;

Asian Conference on Fish Models for Diseases, Bali, Indonesia, 26 – 29 February 2024; International Cardiovascular Medicine Summit, InStem Bangalore, 4 – 5 March 2024; Hannover Medical School, Marburg University, Giessen University, Germany, June 2023; Leipzig University, University Clinic Erlangen, Germany, July 2023; International meeting of the Indian Society of Developmental Biologists, NCBS, Bangalore; Zebrafish- a model in drug discovery and regenerative biology, BIT-Mesra, Ranchi; Zebrafish a model organism in Regenerative Biology 2024, TIFR Mumbai; Ccn2 induces IVD regeneration, 2023, Ashoka University, New Delhi

Rajwade JM Nanobiotechnology@ARI', BRNS-IWSA Popular Science talks at H. V. Desai College, Pune, 14 March 2024

Ratnaparkhi A Indian *Drosophila* Research Conference, IISER, Trivandrum, 6 – 9 December 2023; 3rd Asia-Pacific *Drosophila* Neurobiology Conference, RIKEN, Tokyo, Japan, 27 February-1 March, 2024; IISER-Kolkata, 5 July 2023

Singh SK National Conference on "Plant Health for Food Security: Threats and Promises" organized by ICAR-IISR, Lucknow in collaboration with the Indian Phytopathological Society, New Delhi, at ICAR-Indian Institute of Sugarcane Research (IISR), Lucknow, Uttar Pradesh, 1 – 3 February, 2024.

Tetali S Lecture on the registration process to PPV&FRA in the training cum awareness programme organized by Directorate of Floriculture, August 2023; Lecture on Indian Viticulture and its challenges! in a national conference of the women organized by Indian phytopathological society at Jorhat Assam on 23 December 2023.

Vijayan S Plant adaptation of vertical outcrops around the world and in India, The diversity of rock outcrop plant strategies in a changing world, University of Rostock, Germany, 18 July 2023 (online)

Honours/ Awards/ Distinctions

Choudhary RK received the prestigious Prof Y.S. Murthy Memorial Gold Medal from the Indian Botanical Society for his significant contributions in the field of Plant Taxonomy, 4 Nov 2023; elected as the Fellow of the Linnean Society, UK, 19 October 2023

Jaybhay SA was elected as Councilor for the Southern zone of the Society for Soybean Research and Development, ICAR Indian Research Institute of Soybean Research, Indore

Maurya S PhD student of Choudhary RK, was awarded the prestigious KDB Chougule Burlikar Gold Medal for the best thesis in Botany during the academic year 2022-23, Savitribai Phule Pune University, 17 January 2023

Workshop/ Training organized

Workshop, Fundamentals of LCMS-MS and its application, 23 February 2024.

Workshop, Tools and Techniques for Studying Pathophysiology and Gut Microbiome in Zebrafish, 11-15 March 2024.

Workshop, HPTLC technique: Instrumentation, Regulatory acceptance and its applications in phytochemical analysis, 13 March 2024.

Workshop, Freshwater Biodiversity, 14-15 March 2024.

Training cum awareness programme was organized for Grape growers regarding PPV&FRA act 2001 at Maharashtra Draksh Bagaitdar Sangh Regional Office, Sangli, 15 March 2024.

Workshop, 16S rRNA gene sequence analysis and whole genome analysis for microbial identification, 20-22 March 2024.

Workshop, Molecular Cloning, 21-24 November 2023, 26-28 March 2024.

Several trainings were organized for delivering the updated cultivation technologies of soybean cultivation for the soybean cultivating farmers and agricultural input dealers.

PhD Degree Award

Student, Subject	Thesis	Guide, Co-Guide
Mital Thacker, Botany	Diatoms as indicators of environmental and climatic change in the *Myristica* swamps of the Western Ghats	Karthick B
Smrithi Vijayan, Botany	Study of cliff-dwelling vascular chasmophytes of northern Western Ghats with special emphasis to desiccation tolerant species	Datar MN
Shiwali Rana, Biotechnology	Studies on *Fusarium* spp. for beauvericin production and its applications	Singh SK
Ajay Lagashetti, Biotechnology	Studies on fungal pigments and their application in dyeing textile fabrics	Singh SK
Nikhil Ashtekar, Botany	Studies on taxonomic complexities of Indian Penicillium species following polyphasic taxonomic concept.	Rajeshkumar KC
Rajesh Salve, Biotechnology	Targeted co-delivery of siRNAs for effective therapeutic outcome against metastatic ovarian cancer	Gajbhiye V
Vaibhav Madiwal, Microbiology	Nanoscale surface modification of dental materials for preventing implant related failures	Rajwade JM
Bhushan Khairnar, Biotechnology	Designing and synthesis of novel therapeutic ß-sheet breaker peptides for Alzheimer's disease	Rajwade JM
Sonali Mundhe, Biotechnology	Agronomic, physiological and transcriptomic response of soybean to drought stress at reproductive stage	Patil RM
Parimal Vikhe, Biotechnology	Genetic studies on gibberellin-responsive dwarfing loci Rht14 and Rht18 and their deployment in wheat improvement	Patil RM

Supervision of PhD Students

Guide, Co-guide	Student, Subject	Thesis
Biodiversity - Plants and Diatoms		
Karthick B	Neha Wadmare, Botany	Systematics and Biogeography of the genus *Stauroneis* (Bacillariophyta) from the Indian subcontinent
	Radhakrishnan Cheran, Environmental Science	Aerial diatoms of the eastern Himalayas: Diversity and distribution across environmental gradients
	Vigneshwaran Anbukkarasu, Botany	Diatom Diversity across the Streams and Rivers of the Western Ghats and its Application in Water Quality Monitoring
	Samadhan Pardhi, Botany	Diversity and Distribution of the Genus *Gomphonema* Ehrenberg in the Western Ghats, India

Guide, Co-guide	Student, Subject	Thesis
Karthick B	Pratyasha Nayak, Botany	An integrated morpho-molecular approach to analyse the diatom assemblages for ecological assessment of the Mula- Mutha river basin
	Yogeshwaran Murugesan, Botany	Ecological and Evolutionary Drivers of Gomphonemoid Diatom Diversity in the Western Ghats, India
Choudhary RK	Geetika Sukhramani, Botany	Taxonomy, phylogeny, and historical biogeography of *Smilax* L. in India
	Aditi Sarawgi, Botany	Systematic studies on the genus *Canscora* Lam. (Gentianaceae) in India
	Monali Kadu, Botany	Phytochemical standardisation and pharmacological studies on selected *Haplanthodes* species
Datar MN	Bhushan Shigwan, Botany	Forests of Northern Western Ghats: diversity, composition and effect of disturbance on tree vegetation
	Sarang Bokil, Botany	Systematic studies on *Ischaeminae* J. Presl (Andropogoneae - Poaceae) in India
Biodiversity - Fungi and Lichens		
Singh SK	Malika Suthar, Botany	Studies on melanin from fungi and evaluation of its bioactive potential
	Shweta Kumawat, Botany	Studies on the secondary metabolites from selected Ophiocordycipitaceous and other entomogenous fungi from Western Ghats, India, and evaluation of their bioactivities
Singh PN	Kadambari Pawar, Microbiology	Studies on alkali-tolerant fungi for alkaline protease production and its applications
	Deepak Maurya, Microbiology	Studies on diversity of endophytic actinomycetes from medicinal plants and their bioactivities
Behera BC	Subash Gaikwad, Botany	Studies on selected macro-lichens and their bioactive constituents for its use as pharmaceutical supplements
	Ruchira Sutar, Botany	Studies on antimicrobial, antioxidative, cardiovascular-protective and cytoprotective potential of selected macrolichens and their secondary compounds
	Sachin Mapari, Botany	Studies on cytoprotective and anticancer potential of lichen compounds from selected Himalayan macro-lichens
	Sengar D, Biotechnology	Studies on reversal of drug resistance in ovarian cancer using nanoparticle-nucleotide complexes
Rajeshkumar KC	Sruthi OP, Botany	Molecular systematics and reappraisal of lignicolous Ascomycota from the Western Ghats of India
	Ansil PA, Botany	Polyphasic taxonomy of lichen family *Graphidaceae* from the Western Ghats, India

Guide, Co-guide	Student, Subject	Thesis
	Harikrishnan K, Botany	Deciphering the phylogeny of *Aspergillus* section *Nigri* through a polyphasic approach and exploring their potential as biofertilizers
Bioenergy		
Dhakephalkar PK	Kunal Yadav, Microbiology	Studies on methanogens at extreme eco-physiological conditions: Implications for life on Mars
	Payal Deshpande, Microbiology	Enhanced bio-methanation of untreated rice straw using anaerobic fibrolytic fungi
	Kalyani Deshmukh, Microbiology	Biohydrogen production from rice straw via dark fermentation route
	Vaidehi Pisu, Microbiology	Deciphering the potential of anaerobic gut bacteria as next-generation probiotics for improved health
	Siddhi Chandras, Microbiology	Evaluating potential health benefits and probiotic attributes of *Bacillus* spp.: in vitro and in silico studies
	Roshani Mishra, Microbiology	Phage-mediated control of sulfate-reducing bacteria in oil reservoirs: Mechanisms and Strategies
Dagar SS	Saurabh Gaikwad, Microbiology	Bacteriophages for inhibition of sulfate-reducing bacteria associated with oil reservoir souring
	Kasturi Deore, Microbiology	Thermophilic methanogenic archaea from hot springs and oil reservoirs and their application
	Sai Hivarkar, Microbiology	Investigating the diversity of thermophilic anaerobic bacteria from hot spring environments for utilization of agricultural biomass
	Prajakta Bhujbal, Microbiology	Development of a sustainable bioprocess for second-generation ethanol production using anaerobic microbes
Bioprospecting		
Kulkarni PP	Komal Suryanwanshi, Biotechnology	Understanding the role of metal ions in neurodegeneration and inflammation in Alzheimer's disease
	Padmaja Shete, Biotechnology	Studies on inflammation associated with iron dyshomeostasis and its prevention
Srivastava PS	Gulawani Swapnaja, Biotechnology	A study of the mechanism of action of the natural product-based molecules in gynecological cancers
Developmental Biology		
Ratnaparkhi A	Vasudha Dwivedi, Biotechnology	Exploring the role of the endo-lysosomal pathway in RNA metabolism
	Vrushali Katagade, Biotechnology	Identifying mechanism regulating Fog signalling in glial morphogenesis
	Swarnav Bhakta, Biotechnology	Role of actin-binding protein in heart development and maintenance

Guide, Co-guide	Student, Subject	Thesis
Patra C	Bhagyashri Joshi, Biotechnology	Role of '*celsr1'* in morphogenesis using zebrafish as a model organism
	Ganesh Wagh, Biotechnology	Elucidation of the role of selected secreted molecules in zebrafish development.
	Ashwini Punde, Biotechnology	Role of matricellular protein in vascularization.
Shravage BV	Nidhi Murmu, Biotechnology	Determine the role of autophagy in Germline stem cell ageing in Drosophila
	Kiran Nilangekar, Biotechnology	Determine the role of autophagy in germline stem cell niche in Drosophila
	Karan Selarka, Biotechnology	Autophagy regulators in the female germline stem cell (GSC)-niche
	Mrunmayee Kulkarni, Biotechnology	Mitophagy regulators in the female germline stem cells in Drosophila
	Minal Ayachit, Biotechnology	Role of Atg1 in mitochondrial dynamics during Drosophila Development
Genetics and Plant Breeding		
Oak MD	Methe Pravinkumar, Biotechnology	Development of wheat genotype with good biscuit making properties using marker-assisted selection and mutation breeding
	Kawade Sonali, Biochemistry	Gluten protein dynamics and wheat end-use quality
Ravindra Patil	Venkatesan Suhasini, Biotechnology	Ems-induced mutations for wheat improvement and their detection by TILLING
	Siddhi Chavan, Biotechnology	Investigation of the genetic basis of seedlessness in grapes and its impact on biochemical composition in berries
Tetali SP	Bagwan Juned, Botany	Elucidation of physiological mechanisms contributing to the resilience of wheat under restricted moisture
	Idhol B. D., Botany	Genetic Diversity, Stability, Heterosis and Combining ability studies in Vegetable Soybean (Glycine max (L.) Merrill)
	Phalake S.V., Botany	Evaluation of promising ARI grape hybrids and varieties for end-use and standardization of cultivation practices for hybrid ARI 516
Yashvanthakumar K J	Pawar Pravin Bhausaheb, Botany	Physiology and Genetics of Drought Tolerance in Diverse Germplasm of Spring Wheat (*Triticum aestivum* L.)
Nanobioscience		
Rajwade JM	Aishwarya Padhye, Biotechnology	Evaluation of zinc oxide nanoparticles in delaying the development of diabetic nephropathy
	Snehal Kulkarni, Microbiology	Oligonucleotide-modified nanoparticles as probes for determining antibiotic resistance associated with point mutations in ESKAPE pathogens

Guide, Co-guide	Student, Subject	Thesis
Bodas DS	Tanmayee Sathe, Biotechnology	Design and development of polymer-lipid membrane for application in organ-on-a-chip
	Pooja Suryawanshi, Biotechnology	Development of Ovarian cancer –co T cells Perfused scaffold with emphasis on immunotherapy
Ghormade V	Maheshwari G, Biotechnology	Aptamer based detection of downy and powdery mildew of grapes
	Deepali Chaudhary, Biotechnology	Gene silencing in *Spodoptera litura* through nanocarrier delivered dsRNA
	Vaidehi Bhagwat, Biotechnology	Nano-mediated rapid detection of cucurbit powdery mildew
	Shivangni Singh, Biotechnology	Nano-mediated detection of powdery mildew fungal pathogen in tomato
	Kamal M, Biotechnology	Development of inhalation nanoformulation for delivery of antifungal cell wall and cell membrane inhibitors against Aspergillus lung infections
Gajbhiye V	Aazam Shaikh, Biotechnology	Oncogene repair using splice switching oligonucleotides-nanoparticles complex for the treatment of triple-negative breast cancer
	Surajit Patra, Biotechnology	Development of chikungunya virus antigen-loaded nanoparticles as candidate vaccine
	Niladri Haldar, Biotechnology	Aptamer-tethered lipid-polymer hybrid nanoparticles-mediated CRISPR-Cas9 delivery for targeted gene knockout in triple-negative breast cancer
	Rajkumar Samanta, Biotechnology	CRISPR/Cas9 encapsulated aptamer-decorated lipid-based nanocarriers for targeted gene editing in lung cancer cells
Karpe YA	Pooja Salunke, Biotechnology	Exploring non-pathogenic protozoa as eukaryotic platform for protein expression
	Rohini Nangare, Biotechnology	Development of miRNA, attenuated, and mRNA-based candidate vaccines against Chikungunya virus
Rahalkar M	Jyoti Mohite, Microbiology	Utilizing the potential of methane-oxidizing bacteria for methane mitigation and valorization
	Shubha Manvi, Microbiology	In-depth studies on methanotrophs from Indian rice fields focusing on their applications in plant growth promotion and methane mitigation in rice agriculture
	Kajal Pardhi, Biotechnology	Cultivable methanotrophs from wetlands in Maharashtra for application in the production of carotenoids and as methane mitigation agents

Guidance to students Ninety-eight BSc and MSc students from various institutions were mentored by ARI scientists.

राजभाषा

हिन्दी पखवाड़ा, 14–29 सितंबर 2023

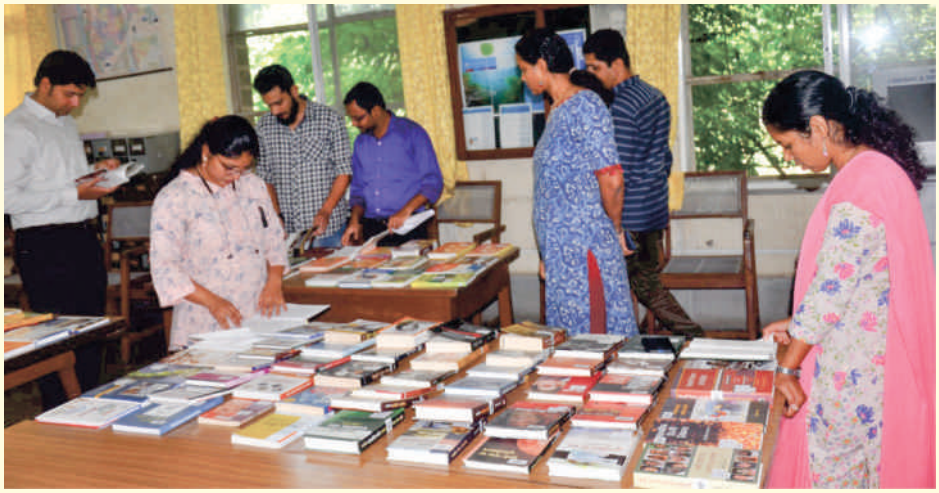
हिन्दी पुस्तक प्रदर्शनी, वैज्ञानिकों द्वारा स्वयं के शोधकार्यों का प्रस्तुतीकरण, निबंध और व्यंगचित्र प्रतियोगिता, वक्तृत्व, शुद्धलेखन एवं अनुवाद प्रतियोगिता इत्यादि का आयोजन हुआ।

शुद्धलेखन एवं अनुवाद प्रतियोगिता

वक्तृत्व प्रतियोगिता

वैज्ञानिकों द्वारा स्वयं के शोधकार्यों का प्रस्तुतीकरण

निबंध लेखन प्रतियोगिताओं के विजेताओं द्वारा उनके निबंधों का वाचन



हिन्दी पुस्तक प्रदर्शनी

प्रमाणपत्र प्राप्त करते प्रतिभागी

हिन्दी कार्यशालाओं का आयोजन

प्रो. अमय कुमार साहू, विभागाध्यक्ष, हिन्दी विभाग, राष्ट्रीय रक्षा अकादमी, पुणे, 23 जून 2023

डॉ. शशिपाल सिंह, संयुक्त निदेशक, अप्लाइड ए.आई ग्रूप, सी-डैक, पुणे, 27 सितम्बर, 2023

डॉ. सुनील केशव देवधर, सहायक निदेशक – कार्यक्रम (सेवानिवृत्त), आकाशवाणी, पुणे, 27 दिसंबर 2023

श्री रत्नेश मिश्रा, सहायक निदेशक (राजभाषा), प्रधान मुख्य आयकर आयुक्त का कार्यालय, पुणे, 19 मार्च 2024

तृतीय अखिल भारतीय राजभाषा सम्मेलन, पुणे, 14–15 सितंबर 2023

डीएसटी द्वारा संचालित 'डीएसटी उत्कृष्ट कार्यान्वयन प्रोत्साहन योजना' एवं 'डीएसटी हिन्दी पत्रिका प्रोत्साहन योजना' के अंतर्गत पुरस्कार की प्राप्ति, हैदराबाद 22 मार्च 2024

सर्वश्रेष्ठ राजभाषा कार्यान्वयन के लिए डॉ. अभय करंदीकर, सचिव, विज्ञान एवं प्रौद्योगिकी विभाग के करकमलों से पुरस्कार लेते डॉ. प्रशांत ढाकेफलकर, निदेशक, एआरआई

'डीएसटी हिन्दी पत्रिका प्रोत्साहन योजना' के लिए प्रमाणपत्र प्राप्त करते डॉ. संजय सिंह, वैज्ञानिक–एफ़, जैवविविधता एवं पुराजैविकी समूह

सर्वश्रेष्ठ राजभाषा कार्यान्वयन के लिए पुरस्कार एवं प्रमाणपत्र प्राप्त करते श्री अ. रहमान, प्रशासनिक अधिकारी (राजभाषा प्रभारी अधिकारी)

Events

National Technology Day lecture, 11 May 2023

Vaccine story, Dr Ganesh Kumraj, Managing Director, BioBridge Healthcare Solutions Pvt. Ltd., Pune

Holistic environment management with innovative practical solutions, Dr Jayant Keskar, CEO, Enpro Envirotech Pty. Ltd., Australia

National Intellectual Property Festival lecture, 12 July 2023

Understanding IP and its importance in research, Dr Nitin Tewari, Head, IP Group, NCL, Pune

Organ Donation Festival, 3 August 2023

Organ Donation pledge followed by interaction with organ recipient Dr Saroj Ghaskadbi and organ donor Dr Surendra Ghaskadbi

Har Ghar Tiranga Campaign, 13-15 August 2023

Vigilance Awareness Week and Precursor, 16 August-15 November 2023

Ethics and governance, Training, Shri. DK Sharma, Finance & Accounts Officer, ARI, 25 October 2023; Cyber hygiene and security, Online lecture, Ms. Manisha Kharade, Technical Officer 'C', ARI, 3 November 2023; GEM procurement, Online Training by DST, 8 November 2023; Systems and procedures of the organization, Training, Shri. A Rahman, Administrative Officer, ARI, 15 November 2023; Integrity pledge

Swachhata Special Campaign 3.0, 2-31 October 2023

National Unity Day Pledge, 31 October 2023

DST Secretary visits ARI, 10 November 2023

Prof. Abhay Karandikar, Secretary to the Government of India, Department of Science & Technology reviewed the progress and lauded the contributions made by ARI in the areas of agriculture, nanotechnology, bioenergy, and life sciences.

Founder's Day Function, 18 November 2023

Dr Rajesh S Gokhale, Secretary to the Government of India, Department of Biotechnology, spoke on Frontiers in Biotechnology.

Floral tribute to the late Prof. SP Agharkar by Dr Anil Kakodkar, President, MACS, who presided over the function.

Global Bio-India 2023, 4-6 December 2023

Transforming Lives, Biosciences to Bioeconomy, Bharat Mandapam, Pragati Maidan, New Delhi. Dr Vandana Ghormade, Dr Sujata Tetali and Dr Tushar Lodha represented ARI.

India International Science Festival 2023, 17-20 January 2024, RCB, THISTI Campus, Faridabad

Dr Virendra Gajbhiye, Dr Ravindra Patil, Dr Sumit Singh Dagar, Dr Yogesh Karpe, Dr Pratibha Srivastava, Dr Tushar Kaushik, Surajit Patra, Swapanja Gulawani and Suhasini V represented ARI.

National Science Day Celebration, February 2024

Lecture: Climate induced hazards in the Himalaya and plausible mitigation, Dr Kalachand Sain, Director, Wadia Institute of Himalayan Geology, Dehradun, 27 February 2024

Interaction with farmers, Hol farm, 28 February 2024

Science exhibition at ARI, 28 February 2024 and GMRT, Khodad, 28-29 February 2024

International Women's Day Lecture and Felicitation, 8 March 2024

Chimerism - A variation of the Central Dogma, Dr Sharmila Bapat, Scientist, NCCS, Pune

Breaking Barriers & Overcoming Challenges, Dr Anupama Engineer, Cofounder & COO, Weinnovate Biosolutions Pvt. Ltd, Pune

Personnel (as on 31.3.2024)

Director

Dr. P.K. Dhakephalkar

Biodiversity & Paleobiology Group

Biodiversity - Fungi

Dr. S.K. Singh, Scientist 'F'
Dr. Rajesh Kumar K.C., Scientist 'E'
Dr. P.N. Singh, Scientist 'E'
Dr. Nischitha R. Scientist 'B'
S. B. Gaikwad, Technical Officer 'A'
D.K. Maurya, Laboratory Assistant 'D'
S.M. Shinde, Laboratory Assistant 'D'

Biodiversity - Lichens

Dr. B.C. Behera, Scientist 'E'
Dr. B.O. Sharma, Technical Officer 'C'

Biodiversity - Palaeobiology

Dr. T. Kaushik, Scientist 'D'
Dr. P.G. Gamre, Technical Officer 'B'

Biodiversity – Plants and Diatoms

Dr. Karthick B, Scientist 'E'
Dr. R.K. Choudhary, Scientist 'E'
Dr. M.N. Datar, Scientist 'D'
N.S. Gaikwad, Laboratory Assistant 'C'
S. A. Pardhi, Laboratory Assistant 'B'

Garden

Dr. S.P. Tetali, Scientist 'D' (Additional Charge)
K. H. Sable, Technical Officer 'B'

Bioenergy Group

Dr. S.S. Dagar, Scientist 'E'
Dr. K. Jangid, Scientist 'E'
P.R. Kshirsagar, Scientist 'D'
Dr. N.G. Kapse, Scientist 'B'
Dr. T.D. Lodha, Scientist 'B'
Dr. V.B. Lanjekar, Technical Officer 'B'
S.K. Tiwari, Attendant 'A'

Bioprospecting Group

Dr. P.P. Kulkarni, Scientist 'F'
Dr. P. Srivastava, Scientist 'D'
Dr. N. Kour, Scientist 'B'
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 'E'
Dr. B.V. Shravage, Scientist 'E'
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 'E'
Dr. S. P. Tetali, Scientist 'D'
S. A. Jaybhay, Scientist 'D'
Dr. Y. Kumar K.J., Scientist 'D'
Dr. V. S. Baviskar, Scientist 'C'
Dr. S.P. Nawathe, Scientist 'C'
Dr. Suresha P G., Scientist 'B'
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 'D'
S. V. Ghadge, Attendant 'C'
D. L. Kolte, Attendant 'C
G. S. Rajguru, Attendant 'B'
T. B. Dhurve, Attendant 'B'

Nanobioscience Group

Dr. J.M. Rajwade, Scientist 'F'
Dr. D.S. Bodas, Scientist 'F'
Dr. V. Ghormade, Scientist 'E'
Dr. V. Gajbhiye, Scientist 'E'
Dr. M.C. Rahalkar, Scientist 'E'
Dr. Y. A. Karpe, Scientist 'E'
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' (Additional Charge)
Dr. S.H. Jadhav, Scientist 'E'
V.M. Gosavi, Attendant 'C'

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
T.V. Kurhade, Assistant 'B'
D.V. Gawade, Assistant 'B'
R.B. Dhobale, Assistant 'B'
R.S. Shinde, Assistant 'B'
S.S. Shah, Assistant 'B'
R.G. Birwadkar, Assistant 'A'
R.M. Dhandhore, Attendant 'D'
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, Officer 'A'
M.V. Patake, Assistant 'B'
S.S. Chavan, Assistant 'B'
S. R. Murade, Assistant 'A'
K.R. Sathe, Attendant 'C'

Purchase Unit

M. B. Tiwari, Officer 'A'
S.S. Kalekar, Officer 'A'
P. D. Gagare, Assistant 'B'
A.V. Wable, Assistant. 'B'

Store Unit

H.N. Mate, Officer 'B'
S.A. Shaikh, Assistant 'B'
P. S. Velankar, Assistant 'A'
R M. Salunke, Attendant 'D'

Engineering Unit (Civil)

A. Rahman, Administrative Officer (Additional Charge)
P.V. Sawant, Technical Officer 'B'
D.S. Shinde, Technician 'B'

Engineering Unit (IT)

M. Kharade, Technical Officer 'C'
Nayankumar D, Technician 'B'

Library & Information Centre

Dr. B.C. Behera, Scientist 'E' (Additional Charge)

R.P. Janrao, Assistant Library & Information Officer

S.A. Deshmukh, Senior Library & Information Assistant

R.R. Kale, Library & Information Assistant

Appointment

Dr. K. Jangid, Scientist E

Dr. N.G. Kapse, Scientist B

Dr. Nischitha R, Scientist B

Dr. T.D. Lodha, Scientist B

Dr. N. Kour, Scientist B

Promotion

Scientific Staff

Dr. D.S. Bodas, Scientist 'F'

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

Dr. R.M. Patil, Scientist 'E'

Dr. S.H. Jadhav, Scientist 'E'

Dr. Y. Kumar, Scientist 'D'

Administrative & NTM Staff

S.S. Kalekar, Officer 'A'

R.B. Dhobale, Assistant 'B'

A.V. Wable, Assistant 'B'

R.S. Shinde, Assistant 'B'

S.S. Chavan, Assistant 'B'

S. S. Shah, Assistant 'B'

P.D. Gagare, Assistant 'B'

Shaikh S.A.M., Assistant 'B'

S.R. Kachhi, Attendant 'D'

V.M. Gosavi, Attendant 'C'

D.L. Kolte, Attendant 'C'

A.B. Kusalkar, Driver

Superannuation

M.H. Mhetre, Lab Asst 'D', on 30.4.2023

A.T. Salvi, Attendant 'C' on 30.4.2023

A.M. Chavan, Scientist 'D' on 31.5.2023

S.S. Deshmukh, Lab Asstt. 'E' on 31.5.2023

S.N. Gajbhar, Attendant 'D' on 30.6.2023

Reservation & Concessions Details of posts filled during 2023-24

Group	SC	ST	OBC	EWS	General	Total
A	1	-	-	2	2	5
B	-	-	-	-	-	-
C	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**

Project Staff

Fellows

Dr. Priyanka Joshi, SERB-NPDF

Dr. Arindam Bhatacharjee, SERB-Ramanujan Fellowship

Dr. Abhinandan Patil, Ramlingaswami Re-Entry Fellowship

Dr. Manojkumar Jadhao, SERB TARE Fellowship

Dr. Hiralal Sonawane, SERB TARE Fellowship

Dr. Girish Pendharkar, SERB TARE Fellowship

Dr. Vinodkumar Ugale, SERB TARE Fellowship

Fellow with Own Fellowship

CSIR Senior Research Fellow

Pratyasha Nayak

Malika Suthar

Ansil P. A.

Sruthi O. P.

Komal Suryavanshi

Mrunmayee Kulkarni

CSIR Junior Research Fellow

Raiping Raleng

UGC Senior Research Fellow

Kalyani Deshmukh
Aditi Sarawgi
Kadambari Pawar
Ruchira Sutar
Padmaja Shete
Karan Selarka
Rohini Nangare
Pooja Suryavanshi
Tanmayee Sathe
Swapnaja Gulawani
Surajit Patra

UGC Junior Research Fellow

Kajal Pardhi
Prajakta Bhujbal
Aditya Eklare
Harikrishnan K.
Vasudha Dwivedi
Shweta Kalke
Swarnav Bhakta
Diksha Negi
Asavari Kulkarni
Deepali Choudhary
Laxmi Jadhav

DBT Senior Research Fellow

Sachin Mapari
Ashwini Punde
Snehal Kulkarni

DBT Junior Research Fellow

Siddhi Chavan
Niladri Haldar
Rajkumar Samanta

DST INSPIRE Faculty Fellow

Dr. Pratibha

DST Senior Research Fellow

Aishwarya Padhye
Maheswari G.

DST Junior Research Fellow

Geetika Sukhramani
Devyani Sengar

DST Women Scientist

Dr. Gargee Pandit

ICMR Senior Research Fellow

Kiran Nilangekar

SARTHI Junior Research Fellow

Jyoti Mohite

Mahatma Jyotiba Phule Research Fellow

Shweta Kumavat

ARI Project

Junior Research Fellow

Kunal Yadav
Monali Kadu

Scheme Project

Field Assistant / Worker

Dipak Dashrath Pawar
Anil Jadhav
Yogesh Nilakhe

Project Assistant

Prajakta Margale
Vaidehi Pisu
Lokesh Mane
Siddhi Chandras
Shweta Bapat

Vishakha Deokate
Shahabaz Pinjari
Saily Harkal
Yogeshwaran Murugesan
Utkarsha Tikhole
Gauravi Vidhate

Project Associate-II

Sai Hivarkar
Saurabh Gaikwad
Pravin Pawar

Project Associate-I

Prashant Rupnawar
Arathi
Shravani Kulkarni

Project Scientist

Dr. Durgadevi Aphale

Research Associate-II

Dr. Deepa Shetty

Research Student

Vaidehi Bhagwat
Shivangni Singh

Sr Project Associate

Dr. Shiwali Rana

Junior Research Fellow

Vaishnavi Dixit
Shivanjali Pansare
Kartik Rangari
Vrushali Katagade
Mrunal Mhatre
Sirisha Thakare
Shubha Manvi
Kamal Mayattu
Aazam Shaikh

Senior Research Fellow

Roshani Mishra
Rajesh Salve

ARI Project

Project Administrative Assistant - Admin Services

Ms Tejashri Bhandare

Junior Hindi Translator Cum Typist

Ms Sukanya Sharma

Hindi Typist

Shri Aditya Bhujang
Ms Rajni Gadekar

Apprenticeship - Admin Services

Shri Shyamal Manna
Shri Sarif Md Masadul Hasan
Shri Bappa Debnath

Cyber Security Status: With reference to the timely directives received from DST, MeitY and CERT-in regarding cyber security for Website, Campus Network security, Email etc., we are in process of complying with the guidelines on priority.

Sponsored Projects List as on 31.03.2024

Sr No	Project Code	Project Title	Sponsored By	Investigators
1	ARI/SP/001	"All India Co-ordinated Research Project on Soybean" (1.4.1968 onwards)	ICAR-IISR, Indore	Mr. S.A. Jaybhay
2	ARI/SP/003	"All India Co-ordinated Wheat Improvement Project" (1.4.1972 onwards)	ICAR-IIWBR, Karnal, Haryana	Dr. YashavanthaKumar K.J
3	ARI/SP/033	"Production of Soybean Breeder Seeds of Annual Oil Seed Crops" (2.2.88 onwards)	ICAR, New Delhi	Mr. S.A. Jaybhay
4	ARI/SP/034	"Front-line Demonstrations of Annual Oil Seed Soybean" (21.2.89 onwards)	ICAR, New Delhi	Mr. S.A. Jaybhay
5	ARI/SP/043	"Front-line Demonstrations in Wheat" (1.4.1993 onwards)	ICAR, New Delhi	Dr. V.S. Baviskar
6	ARI/SP/096	"Wheat Breeder Seed Scheme" (1995 Onwards)	ICAR, New Delhi	Dr. YashavanthaKumar K.J
7	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
8	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
9	ARI/SP/309	"Understanding the regulation of Fog dependent GPCR signaling in the Drosophila CNS" (15.02.2020 to 14.02.2023) Extended upto 14.08.2023	SERB, New Delhi	Dr. Anuradha Ratnaparkhi
10	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
11	ARI/SP/313	"SRB-lytic Bacteriophage Mediated Inhibition of SRB Growth and/ or H2S Production at Pre-pilot scale : Prototype Development and Feasibility Assessment" (15.10.2020 to 14.10.2022) Extended upto 14.08.2023	OECT, New Delhi	Dr. P.K. Dhakephalkar
12	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) Extended upto 30.09.2024	RGSTC, Mumbai	Dr. P.P. Kulkarni
13	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) Extended upto 29.06.2024	SERB, New Delhi	Dr. Rajesh Kumar K.C.
14	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) Extended upto 29.09.2024	SERB, New Delhi	Dr. Ritesh Kumar Choudhary
15	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) Extended upto 29.05.2024	SERB, New Delhi	Dr. B.V. Shravage
16	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
17	ARI/SP/320	"Development of new approaches to live attenuated vaccine against Chikungunya virus" (31.12.2020 to 30.12.2023) Extended upto 30.06.2024	SERB, New Delhi	Dr. Yogesh Karpe

Sr No	Project Code	Project Title	Sponsored By	Investigators
18	ARI/SP/321	“Analysis & characterization of probiotic properties of microbial cultures provided by HTBS” (01.02.2021 to 31.01.2024) Extended upto 31.03.2027 “Heterologous gene expression and gene alterations for qualitative/ quantitative improvement of microbial enzyme catalysed biotransformation” (01.01.2023 to 31.12.2023)	Hi Tech BioSciences India Pvt. Ltd., Pune	Dr. P.K.Dhakephalkar
19	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
20	ARI/SP/326	"Accelerating Genetic Gains in Maize and Wheat for Improved Livelihood (AGG)" (04.10.2021 to 03.10.2024)	ICAR, New Delhi Bill & Melinda Gates Foundation (BMGF) and the United Kingdom’s Department for International Development (DFID)	Dr. YashavanthaKumar K.J Dr. Sudhir Navathe
21	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
22	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
23	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
24	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
25	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
26	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
27	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
28	ARI/SP/334	"Assessment of potential of multifunctional microbial metabolites in developing 'smart' bandages for treatment of supercicial wounds" (13.12.2021 to 12.12.2024)	SERB, New Delhi	Dr. Girish Bhikanrao Pendharkar Dr. J.M. Rajwade
29	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
30	ARI/SP/336	"Candidate Chikungunya virus vaccine To test efficacy of E2 protein-loaded PLGA-PEG nanoparticle as a candidate vaccine in adult and aged mouse model" (01.04.2022 to 31.03.2025)	DST, New Delhi	Dr. Yogesh Karpe
31	ARI/SP/337	"Demonstration of ARI process for biomethanation of rice straw at 25 L scale and process improvement for enhanced biomethanation at higher solid loading rates at 10000 L scale" (Technology Transfer onwards 24.05.2022) (Project Mode 01.12.2022 to 30.11.2023) Extended upto 31.05.2024	GPS Renewables Private Limited, Bangalore	Dr. P.K. Dhakephalkar Dr. Sumit Singh Dagar
32	ARI/SP/338	"Bioprospecting of lichens for assessing the environmental impact level due to quarrying and mining and taxonomic studies of lichens outcrops of the north Western Ghats" (11.10.2022 to 10.10.2025)	DST, New Delhi	Dr. Gargee Pandit

Sr No	Project Code	Project Title	Sponsored By	Investigators
33	ARI/SP/340	“Culturomics and metagenomics based detection of microbes associated with microbial induced corrosion in subsea pipelines and evaluating the potential of different mitigation strategies” (22.10.2022 to 21.04.2024)	IEOT, ONGC, Panvel	Dr. P.K. Dhakephalkar
34	ARI/SP/341	"Application of methanotrophs in rice agriculture for methane mitigation and plant growth promotion". (09.11.2022 to 08.11.2025)	SERB, New Delhi	Dr. Monali Rahalkar
35	ARI/SP/342	"Breeding for high yielding elite soybean cultivars with climate/disease resilience and end-use quality traits by multi-parent hybridization and genomic-assisted selection". (01.09.2022 to 31.08.2027)	Regional Center for Biotechnology, Haryana	Dr. Abhinandan Surgonda Patil
36	ARI/SP/343	"Phytochemical and pharmacological Investigations of some Selected Unexplored Endemic Species of Apiaceae Family of Northern Western Ghats". (17.10.2022 to 16.10.2025)	SERB, New Delhi	Dr. Manojkumar Maroti Jadhao Dr. Ritesh Kumar Choudhary
37	ARI/SP/344	“Sustainable Utilization of Medicinal Plants Resources in Maharashtra" (27.12.2022 to 26.04.2023) Extended upto 31.12.2023	RGSTC, Mumbai	Dr. P.P. Kulkarni
38	ARI/SP/345	"Mass spectrometry based identification and characterization of mycolic acid derived lipid biomarkers and their application for development of a lateral flow POC device for tuberculosis diagnosis" (15.12.2022 to 14.12.2023)	ICMR, New Delhi	Dr. Vandana Ghormade
39	ARI/SP/346	"Understanding synergistic toxicity of Copper, Manganese, and Iron and its implications for neurological disorders" (20.01.2023 to 19.01.2026)	SERB, New Delhi	Dr. P.P. Kulkarni
40	ARI/SP/347	"Isolation and biomass production of selected diatoms as a live feed for shrimp in hatcheries and commercial farms" (30.03.2023 to 29.03.2024)	Amazing Biotech Pvt. Ltd., Tamil Nadu	Dr. Karthick Balasubramanian
41	ARI/SP/348	“Therapeutic investigations and isolation of bioactives from Haplanthodes species, the wild relatives of Kalmegh" (24.03.2023 to 23.03.2026)	RGSTC, Mumbai	Dr. Ritesh Kumar Choudhary

Sr No	Project Code	Project Title	Sponsored By	Investigators
42	ARI/SP/349	"Are gut-dwelling anaerobic fungal lineages between herbivorous ruminants and non-ruminants similar? Investigation using metagenomics and culturomics" (30.05.2023 to 29.05.2026)	SERB, New Delhi	Dr. Sumit Dagar
43	ARI/SP/350	"BIOETHANOL FROM BIOMASS - BAMBOO and RICE STRAW" (28.07.2023 to 27.07.2025)	GPS Renewables Private Limited, Bangalore	Dr. P.K. Dhakephalkar Dr. Sumit Singh Dagar Dr. S.K. Singh
44	ARI/SP/351	"Endo-lysosomal pathway mediated regulation of transsynaptic signaling at the Drosophila synapse" (21.09.2023 to 20.09.2026)	DBT, New Delhi	Dr. Anuradha Ratnaparkhi
45	ARI/SP/352	"Understanding The Role Of Endo-Lysosomal Pathway In Early Embryonic Development" (21.09.2023 to 20.09.2026)	CSIR, New Delhi	Dr. Anuradha Ratnaparkhi
46	ARI/SP/353	"Multifaceted therapy for cardiac regeneration post infarction through delivery of nucleic acids and bioactives via targeted nanocarriers" (10.10.2023 to 09.10.2026)	SERB, New Delhi	Dr. Virendra Gajbhiye
47	ARI/SP/354	"Characterization of farmers' grape varieties and their facilitation for registration with PPVFRA" (16.01.2024 to 15.01.2025)	Protection of Plant Varieties and Farmers' Rights Authority, New Delhi	Dr. Sujata Tetali
48	ARI/SP/355	"Fungal diversity, taxonomic characterization and Identification" (01.01.2024 to 31.01.2025)	ICAR - National Bureau of Agriculturally Important Microorganisms, Uttar Pradesh	Dr. S.K. Singh
49	ARI/SP/356	"Determine the mechanism of Autophagy-related gene-1 (Atg1) in the metabolism of lipids" (06.02.2024 to 05.02.2027)	ICMR, New Delhi	Dr. B.V. Shravage
50	ARI/SP/357	"Investigating cellular and signaling mechanism regulating glial morphogenesis in Drosophila" (14.03.2024 to 13.03.2027)	SERB, New Delhi	Dr. Anuradha Ratnaparkhi
51	ARI/SP/358	"Trans Himalayan lake dynamics as sentinels to global climate change" (01.03.2024 to 28.02.2026)	SERB, New Delhi	Dr. Priyanka Joshi Dr. Karthick Balasubramanian

Audit Report 2023-24

Maharashtra Association for the Cultivation of Science

Independent Auditors Report

We have audited the accompanying financial statements of Maharashtra Association for the Cultivation of Science, Pune which comprise the Balance Sheet as at March 31, 2024, the Statement of Income and Expenditure, for the year then ended, and a summary of the significant accounting policies and other explanatory information.

In our opinion and to the best of our information and according to the explanations given to us, the aforesaid financial statements give the information required by The Maharashtra Public Trust Act, 1950 (earlier known as "The Bombay Trust Act, 1950") in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India: -

i. In the case of Balance Sheet, of the state of affairs of the Trust as at March 31, 2024;

ii. In the case of Income & Expenditure Account, of the Surplus for the year ended on that date.

Basis for Opinion

We conducted our audit in accordance with Standards on Auditing (SAs). Our responsibilities under those Standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the entity in accordance with the ethical requirements that are relevant to our audit of the financial statements, and we have fulfilled our other responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion and no serious irregularity observed.

Management's Responsibility for the Financial Statements

The Trust's Management is responsible for the matters with respect to the preparation of financial statements that give a true and fair view of the financial position, financial performance of the Trust and in accordance with the accounting principles generally accepted in India.

This responsibility also includes maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding the assets of the Trust and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on the financial statements based on our audit. We have taken into account the provisions of the Act, the accounting and auditing standards and matters which are required to be included in the audit report under the provisions of the Act and the Rules made there under.

An audit involves performing procedures to obtain audit evidence about the amounts and the disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal financial control relevant to the Trust's preparation of the financial includes evaluating the appropriateness of the accounting policies used and the reasonableness of the accounting estimates made by the Trust's Management, as well as evaluating the overall presentation of the financial statements.

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.

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

Nikhil Gugale
Partner
UDIN: 24177609BJZYXG7235

Place: Pune
Date: 30/09/2024.

REPORT OF AN AUDITOR RELATING OF ACCOUNTS AUDITED UNDER SUB SECTION(2) OF SECTION 33 & 34 AND RULE 19 OF THE MAHARASHTRA PUBLIC TRUST ACT

Name of the Public Trust: MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE
For year ending 31st March, 2024

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 ofthe 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 ofthe auditor.	NO
K	All cases of irregular, illegal or improper expenditure or failure or omission to recover monies or other property belonging to the public trust or of loss or waste of money or other property thereof and whether such expenditure, failure, omission loss or waste was caused in consequence of breach of trust or misapplication or any other misconduct on the part of the trustees or any other person while in the management of the trust.	NO
L	Whether the minutes books of the proceedings of the meeting is maintained.	YES
M	Whether any of the trustees has any interest in the investment of the trust.	NO
N	Whether the irregularities pointed out by the auditors in the accounts of the previous year have been duly complied with by the trustees during the period of audit.	YES
O	Any special matter which the auditor may think fit or necessary to bring to the notice of the Deputy or Assistant Charity Commissioner	NO

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

Place: Pune
Date: 30/09/2024.

Nikhil Gugale
Partner
UDIN: 24177609BJZYXG7235

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

BALANCE SHEET AS ON 31.03.2024

Amount - Rs.

FUNDS AND LIABILITIES	SCH.	CURRENT YEAR	PREVIOUS YEAR
CAPITAL ACCOUNTS	A	1,07,61,721	1,07,61,721
CURRENT LIABILITIES	B	37,17,309	30,62,319
INCOME & EXP. A/C (Sub Schedule 4)		2,13,78,110	1,91,62,006
TOTAL		**3,58,57,140**	**3,29,86,046**

PROPERTY AND ASSETS	SCH.	CURRENT YEAR	PREVIOUS YEAR
FIXED ASSETS	C	91,85,586	91,93,858
INVESTMENTS	D	1,99,63,949	1,86,44,346
DEPOSITS & ADVANCES	E	38,78,748	32,34,290
CASH & BANK BALANCES	F	28,28,858	19,13,552
TOTAL		**3,58,57,140**	**3,29,86,046**

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

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

HON.F.&A.O.
MACS-ARI.

HON. Treasurer
M.A.C.S.

HON. Secretary
M.A.C.S.

Nikhil Gugale
Partner
M. No. 177609

Place: Pune
Date: 30/09/2024

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

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31.03.2024

Amount - Rs.

EXPENDITURE	CURRENT YEAR	PREVIOUS YEAR	INCOME	CURRENT YEAR	PREVIOUS YEAR
Depreciation : Immovable Properties (By way of provision or adjustment)	7,286	8,157	Interest (Realised)		
			On S.B. A/c	15,340	16,075
			On Investments	18,69,630	8,73,131
			On HDFC S.B. A/c	4,37,660	44,264
Establishment Expenses (As per Schedule H)	2,30,095	2,01,555	Income from other Sources (As per Schedule L)	2,08,000	2,16,000
Audit fees	-	-			
			Income tax refund received (Interest)	18,352	2,708
Depreciation : Plant & Machinery	988	1,646			
Expenditure on the object of The Trust (As per Schedule I)	94,509	91,764			
Surplus carried over to Balance sheet	22,16,104	8,49,056			
TOTAL	**25,48,982**	**11,52,178**	**TOTAL**	**25,48,982**	**11,52,178**

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.
MACS-ARI

HON. Treasurer
M.A.C.S.

HON. Secretary
M.A.C.S.

Nikhil Gugale
Partner
M. No. 177609

Place: Pune
Date: 30/09/2024

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

STATEMENT OF RECEIPTS & PAYMENTS FOR THE YEAR ENDED ON 31.03.2024

Amount - Rs.

RECEIPTS	SCH.	CURRENT YEAR	PREVIOUS YEAR	PAYMENTS	SCH.	CURRENT YEAR	PREVIOUS YEAR
Opening Balances	F	19,13,552	13,26,561	Establishment Expenses	H	2,09,490	2,00,230
Interest Received				Expenditure on Object of Trust	K	39,666	91,764
On Savings Bank A/c		61,781	60,339	Indirect Receipt & Payment	J	60,000	6,04,933
Interest on Investments		9,34,760	5,79,260				
Income tax refund received with interest		18,352	2,708				
Donation Received Nisarg Sevak Sanstha		20,000	10,000				
Income from Other Sources	G	1,88,000	2,06,000	Closing Balances		28,28,858	19,13,552
Indirect Receipt & Payment	J	1,569	6,25,611				
TOTAL		**31,38,014**	**28,10,479**	**TOTAL**		**31,38,014**	**28,10,479**

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.
MACS-ARI

HON. Treasurer
M.A.C.S.

HON. Secretary
M.A.C.S.

Nikhil Gugale
Partner
M. No. 177609

Place: Pune
Date: 30/09/2024

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
TOTAL(RS.)		**1,07,61,721**	**1,07,61,721**

Schedule "B" : Current Liabilities

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
OTHER LIABILITIES	3	37,17,309	30,62,319
TOTAL(RS.)		**37,17,309**	**30,62,319**

Schedule "C" : Fixed Assets

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
LAND AND BUILDING	5	91,84,092	91,91,377
PLANT AND MACHINERY	5	1,493	2,481
TOTAL(RS.)		**91,85,586**	**91,93,858**

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

Schedules to and forming part of Balance Sheet as on 31.03.2024

Schedule "D" : Investments

Amount - Rs.

Sr. No.	Name of the Company	PARTICULARS	Date of Investment	Date of Maturity	CURRENT YEAR	PREVIOUS YEAR
	SHARES					
1	HINDUSTAN MOTORS LTD.	Shares of Rs. 10 each 50 ordinary Share certificate No.33932 bearing Sr. No.4632651-4632700	-	-	500	500
	FIXED DEPOSITS					
1	BANK OF MAHARASHTRA	60088467793	31.12.2023	31.12.2026	3,00,000	3,00,000
		60088467534	31.12.2023	31.12.2026	3,00,000	3,00,000
2	INDIAN BANK	6019228988	29.02.2024	28.02.2025	12,01,641	10,32,625
		6019228671	29.02.2024	28.02.2025	12,01,641	10,32,625
		6056528884	31.07.2021	28.07.2024	2,00,000	2,00,000
4	BANK OF INDIA	50345110007246	24.11.2022	24.11.2024	21,51,778	21,51,778
5	HDFC	50300352429665	12.07.2023	13.07.2024	75,38,397	71,47,178
		50300600778898	05.03.2024	06.03.2026	11,09,145	10,00,000
		50300600781152	05.03.2024	06.03.2026	18,85,545	17,00,000
		50300600779810	05.03.2024	06.03.2026	4,43,658	4,00,000
		50300405767617	26.02.2024	27.02.2026	5,54,497	5,00,000
		50300405767962	26.02.2024	27.02.2026	11,08,991	10,00,000
		50300417029245	09.04.2022	10.04.2024	2,00,000	2,00,000
		50300437838952	13.06.2022	14.06.2024	5,69,640	5,69,640
		50300417031045	09.04.2022	10.04.2024	1,10,000	1,10,000
6	IDFC	10053500553	24.11.2022	07.04.2024	10,88,516	10,00,000
	GRAND TOTAL				**1,99,63,949**	**1,86,44,346**

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

Schedule to and forming part of Balance Sheet as on 31.03.2024

Schedule "E" : Deposits & Advances

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
DEPOSITS :				
Telephone Deposit	10,000		10,000	
Deposit with Court	15,000	25,000	15,000	25,000
ADVANCES :				
Income Tax Deducted at Source	37,54,188	37,54,188	30,96,876	30,96,876
Interest accrued on Investments				
(Subject to confirmation from bank & other agencies)				
As per last Balance Sheet	1,12,414		25,819	
Less Realised during the year	12,854		25,819	
	99,560		-	
Accrued Interest during the year	-	99,560	1,12,414	1,12,414
TOTAL Rs.		**38,78,748**		**32,34,290**

Schedule "F" : Cash & Bank Balances

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	OPENING BALANCE	CLOSING BALANCE	OPENING BALANCE	CLOSING BALANCE
CASH IN HAND	2,218	16,092	7,727	2,218
BANK :-				
With Bank of Maharashtra Erandwana Branch in Savings A/c No.9709	1,54,103	1,04,636	1,51,907	1,54,103
With Union Bank of India, F.C.Road Branch in S.B.A/c 48941261091951	4,10,495	4,21,899	3,98,182	4,10,495
With HDFC SAVING BK A/C No.50100304122670	13,46,736	22,86,231	7,68,745	13,46,736
TOTAL (RS.)	**19,13,552**	**28,28,858**	**13,26,561**	**19,13,552**

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 31.03.2024

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		1,86,000	-	2,04,000
Claim received against loss due to flood			-	-
Life Membership Fees	-	2,000		2,000
TOTAL (RS.)	**-**	**1,88,000**	**-**	**2,06,000**

Schedule "H" : Establishment Expenses

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT ACCOUNT	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT ACCOUNT
Remuneration to Staff	2,06,795	2,06,795	1,92,894	1,92,894
Meeting Expenses	6,272	2,695	7,115	7,115
Shares written off	-	-	1,325	-
Printing & Stationery	-	-	92	92
Miscellaneous Expense	17,017		-	
Bank charges	11		129	129
TOTAL (RS.)	**2,30,095**	**2,09,490**	**2,01,555**	**2,00,230**

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

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Expenditure out of Earmarked Donations		
Home Garden Course Expenses	94,509	91,764
TOTAL (RS.)	**94,509**	**91,764**

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

Schedules to and forming part of Receipts & Payments for the year ended on 31.03.2024

Schedule "J": Indirect Receipts & Payments

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	RECEIPTS	PAYMENTS	RECEIPTS	PAYMENTS
ARI Account	-	-	-	-
Schemes Account	-	-	5,39,000	5,39,000
Advance to staff	1,569	60,000	60,000	60,000
Loans and advances	-	-	26,611	5,933
Current Liabilities	*	-	-	-
TOTAL (RS.)	**1,569**	**60,000**	**6,25,611**	**6,04,933**

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

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Expenditure out of Earmarked Donations		
Home Garden Expenses	39,666	91,764
TOTAL (RS.)	**39,666**	**91,764**

Schedule "L": Income From Other Sources

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Fee for Home Gardening Course	1,86,000	2,04,000
Donation	20,000	10,000
Life Membership Fees	2000	2,000
TOTAL (RS.)	**2,08,000**	**2,16,000**

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

Schedules to and forming part of Balance Sheet as on 31.03.2024

Sub Schedule "1" Trust Fund or Corpus

Amount - Rs.

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

Sub Schedule "2" Other Earmarked Funds

Amount - Rs.

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

Sub Schedule "3" Other Liabilities

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
TDS Payable	37,17,309	30,62,319
TOTAL (RS.)	**37,17,309**	**30,62,319**

Sub Schedule "4" Income & Expenditure Account

Amount - Rs.

PARTICULARS	PREVIOUS YEAR		CURRENT YEAR	
Opening Balance	1,91,62,006		1,83,12,950	
Surplus carried over to Balance sheet	22,16,104		8,49,056	
		2,13,78,110		1,91,62,006
TOTAL (RS.)		**2,13,78,110**		**1,91,62,006**

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

Schedule to and forming part of Balance Sheet as on 31.03.2024

Sub Schedule "5" Immovable Properties

Amount - Rs.

Sr No	Assets	Gross block as at 01/04/23	Rate of Dep	Addition > 6 months	Addition < 6 months	Deletions during the year	Total WDV	Accumalated Depreciation	Depreciation for current year	Net block as at 31/03/24	Net block as at 31/03/23
1	**Land**	91,18,520	0%	-	-	-	91,18,520	-	-	91,18,520	91,18,520
2	**Building**	81,015	10%	-	-	-	81,015	8,157	7,286	65,572	72,857
3	**Plant and Machinery**									-	
	Equipments	12	0%	-	-	-	12	-	-	12	12
	Publications	4,115	40%	-	-	-	4,115	1,646	988	1,481	2,469
	Total	**92,03,662**		**-**	**-**	**-**	**92,03,662**	**9,803**	**8,273**	**91,85,586**	**91,93,858**

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

Schedule to and forming part of Balance Sheet as on 31.03.2024

SUB SCHEDULE "6" FURNITURE AND DEAD STOCK

Amount - Rs.

PARTICULARS	GROSS BLOCK			DEPRECIATION BLOCK						
	Cost as on 1.4.2023	Additions during the year	Total cost as on 31.03.2024	Rate of Depreciation	Up to 31.3.2023	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep.for the Year	Total as on 31.03.2024	WDV as on 31.03.2024
1	2	3	4	5	6	7	8	9	10	11
A)(I) GENERAL										
1. Office Equipment's & Furniture & Sports Items	6,18,987		6,18,987	10%	6,18,986	-	-	-	6,18,986	1
2. Apparatus & Equipment's	3,15,076	-	3,15,076	20%	3,15,075	-	-	-	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%	1,19,521	-	-	-	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	10%	29,670	6,842	-	6,842	36,512	61,578
SUB TOTAL (A)(I)	**12,72,042**	**-**	**12,72,042**		**12,03,617**	**6,842**	**-**	**6,842**	**12,10,459**	**61,583**
A) (II) SPECIAL PUBLICATIONS										
1. Marathi Publication by Prof. M.N. Kamat (Cost of Rs. 1.54)	4,428	-	4,428	40%	2,367	824	-	824	3,191	1,237

Amount - Rs.

PARTICULARS	GROSS BLOCK			DEPRECIATION BLOCK						
	Cost as on 1.4.2023	Additions during the year	Total cost as on 31.03.2024	Rate of Depreciation	Up to 31.3.2023	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep.for the Year	Total as on 31.03.2024	WDV as on 31.03.2024
1	2	3	4	5	6	7	8	9	10	11
2. Enumeration of Plants from Gomantak by Dr. V.D. Vartak (Cost of Rs. 3.60)	3,154	-	3,154	40%	1,100	822	-	822	1,922	1,232
SUB-TOTAL (A)(II)	7,582	-	**7,582**		**3,467**	**1,646**	-	1,646	**5,113**	**2,469**
TOTAL A (I+II)	**12,79,624**	-	**12,79,624**		**12,07,084**	**8,488**	-	**8,488**	**12,15,572**	**64,052**
B) UNIVERSITY OF PUNE										
1. Office Equipment & Furniture	1,300	-	1,300	0%	1,299	-	-	-	1,299	1
2. Books	25,538	-	25,538	0%	25,537	-	-	-	25,537	1
3. Aparatus & Equipments	9,914	-	9,914	0%	9,913	-	-	-	9,913	1
TOTAL (B)	**36,752**	-	**36,752**		**36,749**	-	-	-	**36,749**	**3**
C) GOVT.OF MAHARASHTRA										
1. Office Equipment & Furniture	1,008	-	1,008	10%	1,007	-	-	-	1,007	1
2. Apparatus & Equipments	21,363	-	21,363	20%	21,362	-	-	-	21,362	1
3. Books	1,210	-	1,210	20%	1,209	-	-	-	1,209	1
TOTAL (C)	**23,581**	-	**23,581**		**23,578**	-	-	-	**23,578**	**3**
GRAND TOTAL (A+B+C)	**13,39,957**	-	**13,39,957**		**12,67,411**	**8,488**	-	**8,488**	**12,75,899**	**64,058**

Agharkar Research Institute of Maharashtra Association for the Cultivation of Science

Independent Auditor's Report

To,
The Director,
Agharkar Research Institute of Maharashtra Association for Cultivation of Science

Opinion

We have audited the accompanying financial statements of Agharkar Research Institute of Maharashtra Association for the Cultivation of Science. (MACS-ARI) situated at Gopal Ganesh Agharkar Road, Pune which comprise the Balance Sheet as at March 31, 2024, the Statement of Income and Expenditure, for the year then ended, and a summary of the significant accounting policies and other explanatory information.

In our opinion and to the best of our information and according to the explanations given to us, subject to the "Emphasis of Matter" para in the report, the aforesaid financial statements give the information required by Department of Science and Technology (DST), Ministry of Science and Technology, Government of India in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India: -

i. In the case of Balance Sheet, of the state of affairs of the Institute as at March 3 1, 2024;

ii. In the case of Income & Expenditure Account, of the Surplus for the year ended on that date.

Basis for opinion

We conducted our audit in accordance with Standards on Auditing (SAs). Our responsibilities under those Standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the entity in accordance with the ethical requirements that are relevant to our audit of the financial statements, and we have fulfilled our other responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion and no serious irregularity observed.

Management's Responsibility for the Financial Statements

The Institute's Management is responsible for the matters with respect to the preparation of financial statements that give a true and fair view of the financial position, financial performance of the Institute and in accordance with the accounting principles generally accepted in India.

This responsibility also includes maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding the assets of the Institute and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making

judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on the financial statements based on our audit. We have taken into account the provisions of the Act, the accounting and auditing standards and matters which are required to be included in the audit report under the provisions of the Act and the Rules made thereunder.

An audit involves performing procedures to obtain audit evidence about the amounts and the disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal financial control relevant to the Institute's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on whether the Institute has in place an adequate internal financial controls system over financial reporting and the operating effectiveness of such controls. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of the accounting estimates made by the Institute's Management, as well as evaluating the overall presentation of the financial statements.

Emphasis of Matter

We draw your attention to following matters.

1. The Institute has not Earmarked investments to the extent of its Earmarked Funds.
2. The Institute has changed the method of accounting by not providing expenses incurred but not paid at the end of the year. For example, audit fees, other miscellaneous expenses, etc. Due to this change, the impact on deficits and liabilities could not be ascertained and quantified.

    a) 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 as stated in point no. 1 & 2 above.

    b) 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.

    c) 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.

    d) 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 - 5 "Net Profit or Loss for the year, Prior Period items and changes in Accounting Policies".

    e) There is no separate Reserves and Surplus account maintained by the institute. The balance of Income & Expenditure i.e Deficit is transferred to Capital Fund Schedule.

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

Nikhil Gugale
Partner
UDIN: 24177609BJZYXH6097

Place: Pune
Date: 30/09/2024

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

Balance Sheet as on 31.03.2024

Amount - Rs.

PARTICULARS	SCH	CURRENT YEAR	PREVIOUS YEAR
CAPITAL FUND AND LIABILITIES:			
CAPITAL FUND	1	**24,95,13,646**	**23,08,79,524**
RESERVES AND SURPLUS	2	**-**	**-**
EARMARKED/ENDOWMENT FUNDS	3	**21,19,48,743**	**18,95,83,890**
SECURED LOANS AND BORROWINGS	4	**-**	**-**
UNSECURED LOANS AND BORROWINGS	5	**-**	**-**
DEFERRED CREDIT LIABILITIES	6	**-**	**-**
CURRENT LIABILITIES AND PROVISIONS	7	**21,46,49,512**	**18,15,70,617**
TOTAL		**67,61,11,901**	**60,20,34,031**
ASSETS:			
FIXED ASSETS	8	**37,82,75,209**	**35,16,94,645**
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	**10,62,67,168**	**10,04,50,831**
INVESTMENTS-OTHERS	10	**-**	**-**
CURRENT ASSETS, LOANS, ADVANCES ETC.	11	**19,15,69,524**	**14,98,88,555**
MISCELLANEOUS EXPENDITURES (to the extent not written off or adjusted)			
TOTAL		**67,61,11,901**	**60,20,34,031**
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

The above Balance Sheet to the best of our knowledge & belief contains a True Account of the Funds and Liabilities of the Property and Assets of the Agharkar Research Institute.
Note: Previous year's figures are regrouped wherever necessary

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

Nikhil Gugale
Partner
M.NO.177609

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

(P.K. DHAKEPHALKAR)
DIRECTOR
MACS-ARI

Place: Pune
Date: 30/09/2024

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

Income & Expenditure Account for the Year ended 31.03.2024

Amount - Rs.

PARTICULARS	SCH	CURRENT YEAR	PREVIOUS YEAR
Income			
Income from Sales/Services	12	16,84,516	15,80,060
Grants/Subsidies	13	27,69,03,236	24,69,45,050
Fees/Subscriptions	14	-	-
Income from Investments (Income on Invest. From earmarked/endowment Funds transferred to Funds)	15	-	-
Income from Royalty, Publications etc.	16	19,145	45,600
Interest Earned	17	43,34,311	39,24,254
Other Income	18	1,24,800	60,000
Increase in stock of Laboratory consumables	19	-	81,995
Total (A)		**28,30,66,008**	**25,26,36,959**
Expenditure			
Decrease in stock of Laboratory consumables	19	6,891	
Establishment Expenses	20	22,90,41,254	17,84,26,513
Other Administrative Expenses etc.	21	7,50,79,516	6,92,28,137
Expenditure on Grants, Subsidies etc.	22	-	-
Interest	23	-	-
Depreciation (Net Total at the year-end- corresponding to schedule 8)	8	5,62,66,520	4,64,29,284
Total (B)		**36,03,94,180**	**29,40,83,934**
Balance being excess of Expenditure over Income (A-B)		(7,73,28,172)	(4,14,46,975)
CAPITAL FUND		**(7,73,28,172)**	**(4,14,46,975)**
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

(P.K. DHAKEPHALKAR)
DIRECTOR
MACS-ARI

Nikhil Gugale
Partner
M. NO. 177609

Place: Pune
Date: 30/09/2024

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

Schedules Forming Part of Balance Sheet as at 31.03.2024

Schedule 1: Capital Fund

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
Capital Fund				
Balance as the beginning of the year	22,68,56,835		8,78,63,221	
Add : Contributions towards / Capital Fund (Schedule D)	8,28,47,084		18,04,40,589	
Add/ (Deduct) : Balance of Net Income/ (Expenditure)	(7,73,28,172)	23,23,75,747	(4,14,46,975)	22,68,56,835
Capital Grant				
Balance as the beginning of the year	40,22,689		9,39,43,910	
Add: Capital Grant during the year	10,35,00,000		9,00,00,000	
Add: Interest Earned F.Y 2022-23 (Cap)	-		17,79,054	
Less: TSA (Treasury Single Account)	57,58,653		-	
Less: Interest Paid F.Y 2022-23 (Cap)	17,79,054		12,59,686	
Less: Expenditure during the year	8,28,47,084		18,04,40,589	
		1,71,37,899		40,22,689
Balance at the end of the year		**24,95,13,646**		**23,08,79,524**

Schedule 2: Reserves & Surplus

Amount - Rs.

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

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

Schedules Forming Part of Balance Sheet as at 31.03.2024

Schedule 3: Earmarked/Endowment Funds

Amount - Rs.

PARTICULARS	FUND-WISE BREAK UP				TOTALS	
	Lab. Res. Fund (Tech. Dev. Fund)	Dr. A. B. Joshi	Dr. A. D. Agate	Welfare fund	Current Year	Previous Year
a> Opening balance of the funds	14,70,42,154	7,55,877	2,060	1,26,939	14,79,27,030	13,36,66,358
b> Additions to the funds:	-	-	-	-	-	-
i) Donations/grants	-	-	-	-	-	-
ii) Income from investments made on account of funds.	53,12,409	12,752	-	-	53,25,161	48,26,190
iii) Culture Identification Charges	-	-	-	-	-	-
iv) Overhead Charges from Scheme	26,48,608	-	-	-	26,48,608	24,19,695
v) Interest received on Funds from various projects	-	-	-	-	-	-
vi) Other Misc.	61,99,954	-	-	-	61,99,954	70,14,787
TOTAL (a+b)	**16,12,03,124**	**7,68,629**	**2,060**	**1,26,939**	**16,21,00,752**	**14,79,27,030**
c>Utilisation/Expenditure towards objectives of funds	-	-	-	-	-	-
i> Capital Expenditure	-	-	-	-	-	-
Fixed Assets	-	-	-	-	-	-
Others	-	-	-	-	-	-
ii> Revenue Expenditure	-	-	-	-	-	-
Salaries, Wages and allowances etc.	-	-	-	-	-	-
Rent	-				-	-
Other Administrative Expense	-	-	-	-	-	-
TOTAL (c)	**-**	**-**	**-**	**-**	**-**	**-**
NET BALANCE AS AT THE YEAR-END (a+b-c)	**16,12,03,124**	**7,68,629**	**2,060**	**1,26,939**	**16,21,00,752**	**14,79,27,030**
Add: Balance of Sponsored projects of Schemes (Laibility)	-	-	-	-	4,98,47,991	4,16,56,860
Total Balance as on 31.3.2024	**16,12,03,124**	**7,68,629**	**2,060**	**1,26,939**	**21,19,48,743**	**18,95,83,890**

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

Schedules Forming Part of Balance Sheet as at 31.03.2024

Schedule 4: Secured Loans and Borrowings

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
1. Central Government		0.00		0.00
2. State Government (Specify)		0.00		0.00
3. Financial Institutions				
a> Term Loans	0.00		0.00	
b> Interest Accrued and due	0.00	0.00	0.00	0.00
4. Banks:				
a> Term Loans	0.00		0.00	
- Interest accrued and due	0.00		0.00	
b> Other Loans (Specify)	0.00		0.00	
- Interest accrued and due	0.00	0.00	0.00	0.00
5. Other Institutions and Agencies		0.00		0.00
6. Debentures and Bonds		0.00		0.00
7. Others (Specify)		0.00		0.00
TOTAL Rs.		**0.00**		**0.00**

Note: Amounts due within one year Nil

Schedule 5: Unsecured Loans and Borrowings

Amount - Rs.

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

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

Schedules Forming Part of Balance Sheet as at 31.03.2024

Schedule 6: Deferred Credit Liabilities

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
a) Acceptance secured by hypothication of capital equipment and other assets	0.00	0.00	0.00	0.00
b) Others	0.00	0.00	0.00	0.00
TOTAL Rs.		**0.00**		**0.00**

Schedule 7: Current Liabilities & Provisions

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
A. Current Liabilities :-				
1. Acceptances	-		-	
2. Sundry Creditors:				
a) For Goods		2,74,486		21,41,555
3. Advances Received	-		-	
4. Interest Accrued but not due on:				
a) Secured Loans/borrowings	-		-	
b) Unsecured Loans/borrowings	-		-	
5. Statutory Liabilities:	-		-	
a) TDS Payable	1,62,696		1,18,422	
b) GST TDS payable	12,11,725		-	
c) PF Commissioner A/c	-		-	
d) P.F.New Pension Scheme	46,928			
e) GST Payable	-		-	
f) State Profession Tax	22,000	14,43,349		1,18,422
6. Other current Liabilities	1,53,24,928	1,53,24,928	1,49,20,601	1,49,20,601
7. Unspent Balance of Grant	-		27,52,325	
8. Earnest Money Deposit	10,54,856		10,000	
9. Security deposit	13,18,449		1,61,695	
10. Other Tution Fees & University Share	1,51,950		96,075	
11. Recovery of Bank Loan	-		-	
12. Workshops Meetings etc.	2,10,078		9,08,546	
13. Retention Money	-	27,35,333	1,52,967	40,81,608
Total (A)		**1,97,78,096**		**2,12,62,186**

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
B. PROVISIONS				
1. For Taxation	-		-	
2. Gratuity	9,57,88,253		8,47,28,750	
3. Superannuation/Pension	-		-	
4. Accumulated Leave Encashment	9,88,79,256		7,52,49,548	
5. Trade Warranties/Claims	-		-	
6. Others				
- Salary payable for March			-	
- Audit fees	-		96,000	
- Electricity & Power	-		1,54,404	
- Postage & Telephone	-		25,000	
- Campus maintainance	2,03,907		-	
- Security Service Charges			-	
- Water Charges			-	
- Farm Expense	-		54,729	
- Hired Labour Charges			-	
Total (B)		**19,48,71,416**		**16,03,08,431**
Total (A+B)		**21,46,49,512**		**18,15,70,617**

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004
Schedules Forming Part of Balance Sheet as at 31.03.2024

Schedule 8: Fixed Assets

Amount - Rs.

Sr No	Asset	Gross block as at 01/04/2023	Rate of Depreciation	Addition > 6 months	Addition < 6 months	Deletions during the year	Total WDV	Depreciation for current year	Net block as at 31/03/2024	Net block as at 31/03/2023
I	**Land**	1,74,914	0%	-	-	-	1,74,914	-	1,74,914	1,74,914
II	**Building**	5,25,53,435	10%	-	23,20,880	-	5,48,74,314	53,71,387	4,95,02,927	5,25,53,435
III	**Furniture and Fixtures**	3,04,80,299	10%	1,09,308	1,04,03,155	-	4,09,92,762	35,79,118	3,74,13,644	3,04,80,299
IV	**Plant and Machinery**	-					-	-	-	-
	Computer and Computer software	25,34,890	40%	5,40,429	27,08,363	-	57,83,682	17,71,800	40,11,882	25,34,890
	Vehicles	4,67,016	15%	-	-	-	4,67,016	70,052	3,96,964	4,67,016
	Books	20,81,759	40%	9,998	11,51,021	-	32,42,778	10,66,907	21,75,871	20,81,759
	Equipments	25,91,52,620	15%	23,60,358	6,32,43,572	-	32,47,56,550	4,39,70,215	28,07,86,335	25,91,52,620
	Other Fixed assets	29,13,597	15%	0	-	-	29,13,597	4,37,040	24,76,557	29,13,597
V	**Capital WIP**	13,36,115	0%	-	-		13,36,115	-	13,36,115	13,36,115
	Total	**35,16,94,645**		**30,20,092**	**7,98,26,991**	**-**	**43,45,41,729**	**5,62,66,520**	**37,82,75,209**	**35,16,94,645**

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

Schedules Forming Part of Balance Sheet as at 31.03.2024

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)	10,60,12,167	9,95,58,605
8. Others (FD against LC)	-	6,37,225
TOTAL (Rs.)	**10,62,67,168**	**10,04,50,831**

Schedule 10: Investments - Others

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
In Government Securities	0.00	0.00
Other approved Securities	0.00	0.00
Shares	0.00	0.00
Debentures and Bonds	0.00	0.00
Subsidiaries and Joint Ventures	0.00	0.00
TOTAL (Rs.)	0.00	0.00

Schedule 11: Current Assets, Loans & Advances

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
A. CURRENT ASSETS				
1. Inventories:				
a> Stores and Spares				
b> Publications	5,90,990		5,91,090	
c> Stock-in-trade of consumables (as taken valued and certified by the Management)	2,87,820	8,78,810	2,94,611	8,85,701
2. Sundry Debtors:				
a> Debts Outstanding for a period exceeding six months				

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
3. Cash balances in hand (including cheques/drafts and imprest)	8,328	8,328	8,328	8,328
4. Bank Balances:				
a> With scheduled Banks				
- On Current Accounts	4,90,31,485		3,84,40,630	
- On Deposit Accounts	-		-	
- On Savings Accounts	10,09,494		61,17,789	
- On Current Accounts(TDF)	5,60,97,690	10,61,38,670	4,66,56,154	9,12,14,573
TOTAL (A)		**10,70,25,808**		**9,21,08,602**
B. LOANS, ADVANCES AND OTHER ASSETS				
1. Loans:				
a> Staff (For HBA, Vehicle Advance and Computer)	-		-	
b> Amount receivable from Schemes	27,49,447	27,49,447	28,02,982	28,02,982
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.)	8,43,977		4,18,805	
d> Deposits kept with Govt. Agencies (MSEB, Telephone, Gas Cylinder etc.)	17,78,744	26,22,721	17,00,464	21,19,269
3. Income Accrued:				
a> On Investments from Earmarked/Endowment Funds	23,35,553		41,29,412	
4. Sundry Debtors	-		3,659	
5. Advance to Suppliers (Prior to 2013-14)	-		6,87,528	
6. Income Tax (TDS) Current	21,58,042		21,52,844	
7. GST TDS	6,788		6,788	
8. GST Input /Service Tax Input	2,48,23,174		41,89,330	
9. Kumar Krishi Mitra Fellowship	-		31,281	
10. Sponsored Projects of Schemes (Asset)	4,98,47,991		4,16,56,860	
		7,91,71,548		5,28,57,701
TOTAL (B)		**8,45,43,715**		**5,77,79,952**
TOTAL (A+B)		**19,15,69,524**		**14,98,88,554**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2024

Schedule 12: Income From Sales/Services

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Income from Sales		
a) Sales of Finished Goods (Farm Produce)	-	-
b) Sale of Raw Material	9,060	-
c) Sale of Scraps	4,94,270	5,15,765
d) Sale of Wistar Rats	1,56,800	54,160
2. Income from Services		
a) Cultural Identification Charges / Analytical Services	9,83,314	9,76,237
b) Others	869	-
c) Testing fees-Soyabean/Wheat	-	-
d) Consultancy Services	40,203	33,898
Total (Rs.)	**16,84,516**	**15,80,060**

Schedule 13: Grants/Subsidies

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Central Government	39,14,00,000	35,75,00,000
Grant in Aid General	7,97,00,000	5,50,00,000
Grant in Aid Salary	20,82,00,000	21,25,00,000
Grant in Aid Capital	10,35,00,000	9,00,00,000
Less: Transferred to Schedule 1 (Capital Fund)	10,35,00,000	9,00,00,000
Less: TSA (Treasury Single Account)	1,33,02,475	4,75,27,196
Total Grant (GIA General & GIA Salary)	**27,45,97,525**	**21,99,72,804**
Add: Unspent balance at the beginning of the year	27,52,325	3,08,83,079
Add: Interest Earned on Grant (2022-23)	-	4,46,614
Less: Unspent balance at the year end	-	27,52,325
Less: Interest refund back to DST (2022-23)	4,46,614	16,05,122
Sub-total	**27,69,03,236**	**24,69,45,050**
2. State Government		-
3. Government Agencies		-
4. International Organisations		
5. Others (Specify)		-
Net Surplus of sale of Assets		-
Total (Rs.)	**27,69,03,236**	**24,69,45,050**

* Unspent balance of grant is against recurring balance & non-recurring balance is regrouped

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

Schedules Forming Part of Income & Expenditure Account for the Year Ended 31.03.2024

Schedule 14: Fees/Subscriptions

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Entrance Fees (Library Membership fees)	-	-
2. Annual Fees (Licence fees)/Subscriptions	-	-
3. Seminar/Program Fees	-	-
4. Others (Ph.D. Tuition fee, Ph.D. Provisional Admission fee)	-	-
Total (Rs.)	**-**	**-**

Schedule 15: Income From Investments

Amount - Rs.

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

Schedule 16: Income from Royalty, Publications, etc.

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1. Income from Royalty	-	-
2. Income from Publications	-	-
3. Others (Sale of Tender Forms/I Cards)	-	-
4. Application Money	19,145	45,600
Total (Rs.)	**19,145**	**45,600**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2024

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	42,54,087	39,24,254
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	-	-
4. Interest on Debtors and Other Receivables	79,701	-
5. Penal interest	523	
Total (Rs.)	**43,34,311**	**39,24,254**

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	-	-
4) Miscellaneous Income	1,24,800	60,000
Total (Rs.)	**1,24,800**	**60,000**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2024

Schedule 19: Increase/(Decrease) In The Stock Of Finished Goods & Work In Progress

Amount - Rs.

PARTICULARS	PREVIOUS YEAR	CURRENT YEAR
a) Closing stock		
- Laboratory Consumables	2,87,820	2,94,611
- Finished Goods	-	-
- Publications	5,90,990	5,91,090
	8,78,810	8,85,701
b) Less: Opening Stock		
- Laboratory Consumables	2,94,611	2,12,616
- Finished Goods	-	-
- Publications	5,91,090	5,91,090
	8,85,701	8,03,706
Net Increase/(Decrease)	**(6,891)**	**81,995**

Schedule 20: Establishment Expenses

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
1) Salaries and Wages	15,90,43,178	14,66,31,156
2) Allowances and Bonus	18,56,000	18,09,000
3) Contribution to Provident Fund & New Pension Scheme	1,68,94,089	1,54,64,143
4) Contribution to Other Fund (D.L.I.F.)	1,80,491	2,16,285
5) Staff Welfare Expenses	16,50,248	10,34,939
6) Expenses on Employees Reitrement and Terminal Benefits	4,54,10,208	87,16,041
7) Stipend to Research & Fellowship Students	21,58,889	29,29,647
8) Encashment of Earned Leave for LTC	18,48,151	16,25,302
TOTAL	**22,90,41,254**	**17,84,26,513**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2024

Schedule 21: Other Administrative Expenses

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Advertisement & Publicity	3,51,310	76,737
Auditors Remuneration	-	96,000
Electricity & Power	1,31,10,160	78,59,799
Exhibition Organaised By Arai	1,65,100	7,27,352
Farm Expenses	36,18,597	24,63,638
Hospitality Expenses	6,10,166	2,62,814
Insurance	-	3,381
Legal & Professional Fess	16,94,583	9,86,465
Other Office Expenses	6,82,730	4,80,159
Postage, Telephone & Communication	2,55,625	3,35,334
Printing & Stationery	8,59,785	8,07,942
Purchases Of Chemicals & Glassware	1,84,45,458	1,92,57,683
Rent Rates & Taxes	21,44,952	16,78,788
Repairs & Maintenance	1,16,01,977	1,31,27,161
Retired Staff Medical Expenses	7,60,659	8,02,823
Security & Labour Expenses	1,39,90,941	1,28,70,520
Seminar /Workshop Expenses	15,10,092	28,50,884
Subscription Fees	18,21,043	10,22,639
Travelling & Conveyance	12,89,404	17,88,144
Vehicle Running And Maint Exps	1,76,913	1,38,245
Water Charges	15,16,662	12,73,002
Commission To Agency	43,187	35,980
Publication	-	5,000
Other Staff Expenses	3,98,314	2,77,648
Course fees for various programms	31,860	-
TOTAL (Rs.)	**7,50,79,516**	**6,92,28,137**

Schedule 22: Expenditure on Grants, Subsidies etc.

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
a) Grants given to Institutions/Organisation	0.00	0.00	0.00	0.00
b) Subsidies given to Institutions/ Organisations	0.00	0.00	0.00	0.00
TOTAL Rs.		**0.00**		**0.00**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2024

Schedule 23: Interest

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
a) On Fixed Loans	0.00	0.00	0.00	0.00
b) On Other Loans (including Bank Charges)	0.00	0.00	0.00	0.00
c) Others (Specify)				
TOTAL Rs.		**0.00**		**0.00**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2024

Schedule D: Transfer to Capital Fund

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
Other Fixed Assets				
Books	11,61,019		14,76,782	
Computer / Peripherials/Softwares	32,48,792		5,20,352	
Office Furniture & Dead Stock	1,05,12,464		37,06,890	
App. & Equipments	6,56,03,930		17,28,19,582	
Renovation of Committee Room	23,20,880		19,16,983	
Total (Rs.)		**8,28,47,084**		**18,04,40,589**

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

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

(P.K. DHAKEPHALKAR)
DIRECTOR
MACS-ARI

Nikhil Gugale
Partner
M. NO. 177609

Place: Pune
Date: 30/09/2024

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 31st March 2024

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 has been provided for on written down value method as specified in the Income Tax Act, 1961.

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
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DIRECTOR
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Nikhil Gugale
Partner
M. NO. 177609

Place: Pune
Date: 30/09/2024

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 31.03.2024

Schedule 25: Contingent liabilities and Notes on Accounts

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 GIA General and GIA Salaries 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 and leave encashment obligation are as per below:-

Sr. No.	Particular	Gratuity	Leave Encashment
1	Withdrawal Rate	3.00%	3.00%
2	Discounting Rate	7.21%	7.21%
3	Future Salary Rise	10.00%	10.00%
4	Encashment Rate while in service	5.00%	5.00%

The position of gratuity payable on death/retirement of employees and leave encashment as on 31st March, 2024 is as below:

Particulars	Provision for Gratuity	Provision for Leave Encashment
Opening balance as on 1st April 2023	8,47,28,750	7,52,49,548
Add:- Addition during the year 2023-24	1,10,59,503	2,36,29,708
Less:- Deduction during the year 2023-24	---------	---------
Closing Balance as on 31st March 2024	9,57,88,253	9,88,79,256

8. Impairment of Assets

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

9. Previous year figures are rearranged, recast or regrouped wherever necessary, to make them comparable with those of the year under audit.

10. 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.

11. In case of items debited to Income and Expenditure account, it was informed to us that the expenditure is not of capital nature.

12. Depreciation on fixed assets has been provided on written down method (WDV) as per the rates prescribed under Income Tax Act, 1961. Assets are regrouped as per the requirements of the Act wherever required.

13. Interest earned on grants-in-aid is payable to Department of Science & Technology (DST) as per Rule 230(8) of GFR, 2017.

14. There is no separate Corpus Fund created by the Institute, it is the balance of Income & Expenditure Account i.e. Surplus/ Deficit and expenditure done for purchase of equipments during the financial year is transferred to Capital Fund Schedule.

15. Current year provision are made on bases of available grant balance.

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

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

(D.K. SHARMA)
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Partner
M. NO. 177609

Place: Pune
Date: 30/09/2024

Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

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