MACS

Annual Report 2013-14

Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

Vision

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

Mission

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

MACS

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Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

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Dr GK Wagh

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Dr Kalyan Banerjee
President
Maharashtra Association for the Cultivation of Science
Pune

Dear Friends,

I have the pleasure of presenting to you the MACS-ARI annual report 2013-14. Maharashtra Association for the Cultivation of Science has been working on its mandate of encouraging research, popularising science, and reaching to the society.

The research laboratory of MACS, i.e. ARI, has made us proud once again through its successes in development of wheat, soybean and grape varieties. Recently identified wheat variety MACS 6478 is the fourth variety identified by ICAR's wheat workshop during the past five years for timely sown irrigated conditions. A high yielding soybean variety MACS 1188 was released and notified by ICAR for its cultivation in Southern Zone. This variety is resistant to major insect pests, diseases, has pod shattering habit, and high yield potential. Grape hybrid ARI-1308 (James/ Kishmish belli) produced yellowish green, spherical, seedless berries with high TSS and could be used for table purpose.

Developmental biology studies on hydra have shown that vascular endothelial growth factor and fibroblast growth factor play important roles in the formation of the blood vascular system, axon guidance, nervous system development and function.

One of our studies explores the oral hypoglycemic agents from *Costus igneus* and other plants known in traditional systems of medicine. The plant *Costus igneus* (*C. pictus*) is popularly known as insulin plant and is cultivated in the coastal area of Uttar Kannada district of Karnataka. It has been observed that the mechanism of action of its insulin like protein is similar to human insulin.

Biohydrogen production from distillery waste has progressed well. The bacterial strain DMHC-10 isolated by our scientists is a novel species designated as *Clostridium biohydrogenium* sp.nov.

In the areas of nanomedicine, nanodiagnostics, and nanoagriculture ARI scientists got good leads in glucose lowering ability of zinc oxide nanoparticles; in-house designing of a PCR device; diagnostic methods for rapid and efficient detection of viral pathogens at early stages of disease; RNA interference for insect control; enhancing germination efficiency in medicinal trees.

Quality standards, and phytochemical reference standards of Indian medicinal plants have been documented by ARI scientists and these have been published by the Indian Council of Medical Research.

Studies on the complex bivalve trace fossil *Hillichnus* are evidence to presence of tellinaceans in the Jaisalmer Formation indicating that India can be considered as the oldest record of *Hillichnus lobosensis.*

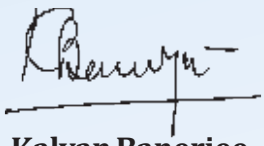
Virological studies are focussing on the bacteriophages of certain *Salmonella* spp., bacteriophages against typhoid causing organism, and lytic bacteriophages.

Besides research MACS has been promoting courses on home gardening, and field Botany. These courses are attended by nature enthusiasts ranging from students to housewives to professionals.

This year the 53rd Prof. SP Agharkar Memorial Oration was delivered by Prof. Mangala Rai, Agriculture Adviser to Chief Minister, Bihar, and Former Director-General, Indian Council of Agricultural Research, New Delhi. On the occasion a book 'Dr AB Joshi' authored by Shri AP Deshpande, Marathi Vidnyan Parishad, Mumbai was released. Dr GB Deodikar Memorial Oration was delivered by Prof. Kasturi Datta, DBT Distinguished Biotechnology Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi. Shri GB Joshi Memorial Oration was delivered by Dr Shekhar C Mande, Director, National Centre for Cell Science, Pune.

MACS has also been administering awards in the name of renowned plant scientists, viz. Shri VP Gokhale Award in recognition of significant research contribution in the various areas of Phytopathology; Shri RB Ekbote Award in recognition of significant research contribution in the various areas of Botany; on the donations made by their relatives. Dr BM Khadi was awarded Shri RB Ekbote Award. Dr K Gopal was awarded Shri VP Gokhale Award. Dr Pradnya P Kanekar Award for the best paper published by young scientist of MACS-ARI was bagged by Dr Rinku Umrani.

I thank my colleagues and MACS' life members for their valuable inputs in making MACS a vibrant organisation.



Kalyan Banerjee
21 August 2014, Pune

From the Director's Desk

Thank you for an encouraging response to our previous year's report. I received commendation from seniors and non-specialist readers for the brevity and simplicity of presentation. Of course change is permanent. The report will continue to evolve.

I am pleased to present some of the salient research outcomes during 2013-14:

- Bacterial diversity studies yielded a total of 103 isolates/ 72 genovars, of which 19 strains were identified by 16S rRNA gene sequencing as putative members of novel species
- A bacterial consortium was developed for bioremediation of formation waters. This consortium could degrade up to 98 % of the Total Petroleum Hydrocarbons present in the formation water
- MACS 6478 is the fourth variety identified by wheat workshop during past five years for timely sown irrigated conditions
- As a result of the public-private-partnership MoU with ITC Wheat Choupal Pradarshan Khets (CPK) were conducted in Karnataka state during *Rabi* 2013-14
- High yielding soybean variety MACS 1188 was released and notified for its cultivation in Southern Zone
- Findings on VEGF and FGF in hydra are significant since these could help in designing strategies for identifying the evolutionary ancient functions of these, and probably other growth factors
- Purified insulin like protein showed good glucose lowering property when fed orally to experimentally induced diabetic Swiss mice
- Using the bacterial strain DMHC-10 a process was developed for biohydrogen production from distillery waste
- PCR device was designed in-house and is being tested for carrying out amplification of DNA with the aim of developing a functional diagnostic device
- Our experiments demonstrate that chitosan nanoparticles can be used as a vehicle for delivery of dsRNA and can be effective in insect control
- Phytochemical Reference Standards and quality standards were accepted by Indian Council of Medical Research for publication

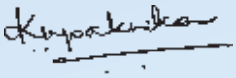
This year saw a good interaction with corporates including DSM India Pvt. Ltd., Gurgaon; Reliance Industries Ltd., Mumbai; IRS-ONGC, Ahmedabad; KDMIPE, ONGC, Dehradun; Roboniks, Thane; Kanbiosys, Pune; Praj, Pune.

Intellectual property materialized into nine patent applications. Fifty-one research papers were published. Four students were awarded the PhD degree by the University of Pune. Fifty-five sponsored projects were operated.

Fresh appointments in the scientific and administrative categories have rejuvenated the institute's work force.

I thank my colleagues for their cooperation.

I thank the Maharashtra Association for the Cultivation of Science, and Department of Science and Technology, Government of India for its continued support.



(**KM Paknikar**)
Director (Officiating)
Agharkar Research Institute

21 August 2014, Pune

Biodiversity

Bacteria

Microbial diversity and bioprospecting

Hidden treasure trove

Mud volcanoes, oil reservoirs and methane hydrates represent some of the extreme and pristine ecological niches that inhabit a diverse range of extremophiles. Composition and diversity of bacterial communities growing in these extreme ecological niches were investigated for taxonomic novelty using PCR-DGGE-sequencing analyses of 16S rRNA gene fragments.

RSM based approach was used to optimize PCR reaction for unbiased amplification and 15 folds improvement in PCR amplification was achieved. DGGE profiles of PCR products obtained in presence of additives revealed the existence of extra bands (representing OTUs) as compared to fewer bands obtained without the use of any additives.

Bacterial diversity of oil reservoirs was studied by both culture dependent and culture independent approaches. Culture dependent methods yielded a total of 103 isolates/ 72 genovars, of which 19 strains were identified by 16S rRNA gene sequencing as putative members of novel species.

Methane hydrate samples were analyzed for their microbial diversity. A total of 32 bacterial isolates were obtained from culture dependent approach, of which the methanogens have been identified as members of *Methanoculleus* species. Majority of non-methanogens were psychrotolerant and halophilic, growing on complex substrates like pectin, chitin, and cellulose.

Bacterial isolates from pristine habitat were screened for industrially important applications. *Bacillus lichiniformis* MCM B-888 demonstrated the highest inulinase activity of 5U ml^{-1} at 55 °C and pH 6.0 under optimized conditions. Inulinase enzyme finds application in food, pharmaceutical and fuel industries. The gene responsible for the inulinase activity was cloned into pET15b expression vector and expressed in *E. coli* BL21(DE3) for improved productivity and activity.

Recombinant hydantoinase for the production of unnatural optically pure amino acids was obtained in earlier studies. RSM based optimization was carried out to improve the soluble expression of recombinant MCM B-887 hydantoinase. Two factorial data revealed temperature and induction period as significant parameters influencing the hydantoinase yield. These parameters were further optimized by using the Central Composite Design. Highest hydantoinase production of 1800 U L^{-1} was obtained which improved the yield by almost 1.8 folds. Further the enzyme was tested for industrially relevant properties and was found to be alkalitolerant as well as thermotolerant.

A bacterial consortium capable of growing at 96 °C was studied for its efficiency for enhanced oil recovery. Optimization of medium constituents for enhanced gas and metabolite production was carried out.

Sandstone experiments that simulate the oil reservoir conditions were performed which revealed 61.5% of oil recovery.

A bacterial consortium was developed for bioremediation of formation waters. This consortium could degrade up to 98% of the Total Petroleum Hydrocarbons present in the formation water.

Thus, in the present investigation, both, uncultured as well as cultured microbial diversity of a variety of extreme and pristine environment was explored for the taxonomic novelty. Several putative novel species were isolated and identified. Further, these organisms were exploited for valuable industrial processes such as biocatalysis, enhanced oil recovery, waste treatment, etc.

Anaerobes from human gut

My gut tells me

Out of 65 isolates of obligate anaerobic bacteria isolated from human gut, 9 isolates proved to be novel on basis of polyphasic analysis. The two isolates BLPYG-7 and NMBHI-10, based on polyphasic identification were identified as the novel species of genus *Megasphaera.* This novel species is designated as *Megasphaera indica* sp.nov. with strain NMBHI-10^T as the type strain. *Megasphaera* is a very common anaerobe in cattle rumen. However, isolation of *Megasphaera* from human gut is being reported for the first time. The comparative genome analysis of novel strains and type strain of *Megasphaera elsdenii* revealed adaptive features of the isolates for survival in human gut. The key findings include features like bile resistance, presence of sensory and regulatory systems, stress response system, membrane transporters and resistance to antibiotics. The total gene repertoire involved in breakdown of carbohydrates is termed the 'glycobiome'. Comparison of 'glycobiome' of ruminal isolates NMBHI-10 and BLPYG-7 showed presence of some diverse unique sets of Carbohydrate-Active enzymes (CAZymes) among these isolates, with higher collection of CAZymes in human gut isolates. This can perhaps be attributed to the difference in host diet and thereby the environment, consequently suggesting host specific adaptation in these isolates.

A novel species of *Megasphaera* is created to accommodate two novel anaerobic bacteria BLPYG-7 and NMBHI-10 and designated as *Megasphaera indica.* The whole genome sequence analysis of the novel species alongwith *Megasphaera elsdenii* was done in collaboration with MCC-NCCS. It also revealed the crucial adaptive features of *Megasphaera indica* for survival in the human gut. *In vivo* studies would help to confirm the predicted beneficial effect of these isolates on the host.

Fungi

Biodiversity, systematics and conservation

Fungi Forests and cultivated areas in Maharashtra and Karnataka were explored. More than 55 fungi belonging to different taxonomic groups were isolated and documented. Some interesting entomogenous and saprophytic Entomopthorelean fungi used in biological control were documented. Studies on endophytic fungi led to the identification of 11 endophytic fungi from *Calotropis procera,* 12 from *Holarrhena antidysenterica* and 14 from *Cinnamomum zeylanicum*.

Lichens Various forest localities in Kerala were surveyed for lichen diversity. About 135 different lichen specimens were collected and studied in details. In addition, morpho-anatomy and chemotaxonomy (TLC) of over 100 lichen specimens was done.

Plants

Collection, conservation and multiplication of germplasm of wild resources

Plant community studies on selected grasslands of Western Maharashtra

Higher rainfall favours palatable grasses

Field studies were conducted in eleven sampling locations in addition to ten locations in the previous year. Sixty-seven quadrats were taken in these locations to document grassland communities, associations and density of grasses.

Canonical correspondence analysis of the 21 locations, covered during the last two years, suggested that locations with higher rainfall show dominance of palatable species, while grasslands that are subjected to grazing and burning show awned species like *Aristida, Heteropogon* that are unpalatable. Community protected (from grazing and burning) grasslands showed more palatability. Overgrazed and burnt grasslands are poor in diversity and dominated by one or two species.

Accepted name for wild form of *Cucumis sativus*, i.e. *Cucumis sativus* forma *hardwickii* (Royle) WJ de Wilde & Duyfjes

Wild form of cucumber named

During the field tours wild form of *Cucumis sativus* L. was collected and studied. Based on diagnostic characters, it was suggested to accept this form as a wild form of *Cucumis sativus*, i.e. *Cucumis sativus* forma *hardwickii* (Royle) WJ de Wilde &Duyfjes (Figure 1).

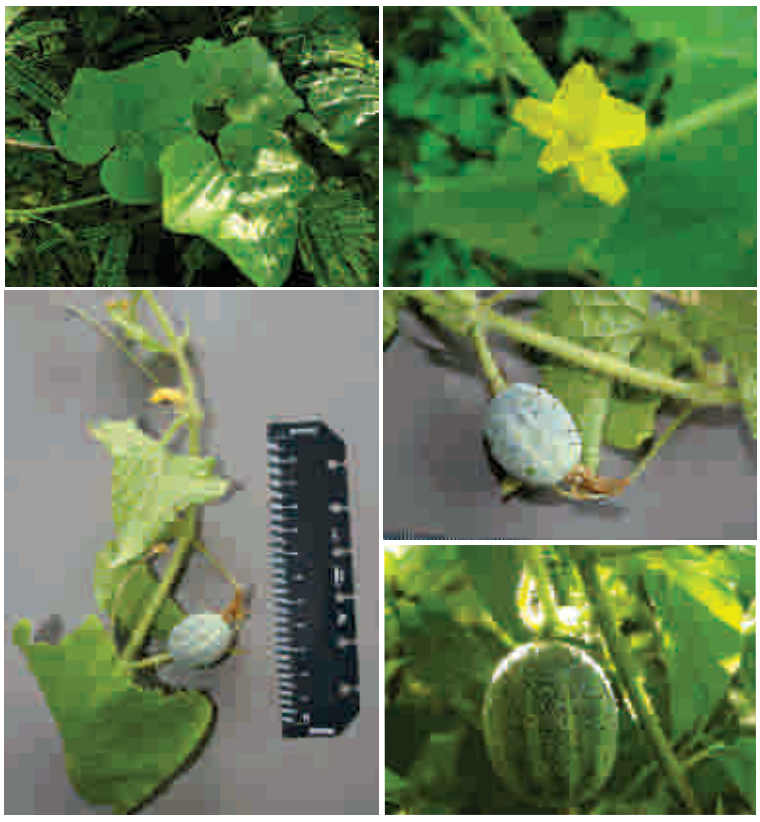


Figure 1 Diagnostic characters of *Cucumis sativus* forma *hardwickii* (Royle) W. J. de Wilde & Duyfjes

Recovery of Rare Endangered Threatened (RET) species of *Ceropegia* from Western Ghats

Back to nature

Under the DBT sponsored project efforts are being made to micropropagate and reintroduce RET *Ceropegia* species. Hardening period was optimized for the respective species. For reintroduction locations around Pune were selected based on natural habitats of respective species (Table 1, Figure 2).

Figure 2 Reintroduction of *Ceropegia*

Table 1 Locations and number of plantations for *Ceropegia* species

Species	Location	Saplings planted (no.)
C. maccannii	Purandar, Sinhgad, Torna	600
C. rollae	Durgawadi, Purandar	550
C. mahabalei	Ralegan, Shindewadi, Tambe, Utshir	450

Studies on diet preferences of plant species favoured by Indian giant squirrel (*Ratufa indica*) and their regeneration in Rai and Chaura areas of Bhimashankar

Squirrel's diet

Food species and their regeneration favoured by Indian giant squirrel were being studied from the Bhimashankar area for the past two years. It can be concluded that Rai is richer in number of species of plants as compared to Chaura. Rai had more germination of seedlings but the established individuals were almost same in both the areas. *Actinodaphne*, *Syzygium* and *Mangifera* which are most common food species of giant squirrel, show normal trend of distribution across various growth stages.

Crop improvement

Biotechnology, tissue culture, improvement of wheat, soybean and grape are the areas of research, the highlights of which are presented here.

Biotechnology

Identification and implementation of molecular techniques to improve agricultural productivity

Assessment of genetic diversity in durum cultivars using SSR markers

A set of 38 durum cultivars and 36 landraces was assessed for variability using 47 microsatellite (SSR) markers distributed on all the 14 chromosomes. The SSR marker set included 31 GWM, 7 WMC, 8 DuPw and 1 BARC markers. Since same set of markers was used earlier for 48 dicoccum genotypes, polymorphism information within and between three groups was compared and combined cluster analysis using allele size data for total 122 genotypes was carried out. In the combined set, total 307 alleles were obtained at 52 loci. In cluster analysis, two main clusters, one consisting of all durum cultivars and landraces and the other with all dicoccum genotypes were observed. Within durums, two distinct subclusters with all landraces and cultivars were observed. The data will be useful in durum wheat breeding as well as to identify core set within the germplasm. The comparative data should be useful to understand evolution within cultivated tetraploid wheat.

Marker assisted breeding

Under the accelerated crop improvement programme (ACIP) of the Department of Biotechnology improvement of grain protein content and gluten strength in the popular bread wheat varieties NI 5439 and MACS 2496 of peninsular region and grain protein and yellow pigment content in the durum wheat varieties MACS 3125 and HI 8498 using marker assisted breeding was undertaken. Development of biotic stress resistant varieties by incorporating leaf rust resistance genes and stem rust resistance genes is also underway. For majority of the traits, respective introgressed lines are being tested in field trials.

Molecular mapping of GA-sensitive dwarfing genes and crop establishment traits in durum wheat

GA-sensitive dwarfing genes with longer coleoptile may provide a useful alternative to widely used GA-insensitive dwarfing genes under water stress conditions. These genes are needed for diversification of reduced height genes in durum germplasm. In view of the above, it is important to generate genetic and genomic resources to understand molecular basis of GA-sensitive dwarfing genes. Castelporziano, Durox and Icaro are durum wheat with GA-sensitive dwarfing genes *Rht14*, *Rht15* and *Rht18*, respectively. Study of association of these genes with coleoptile length, early vigour, plant height and root traits is in progress.

Marker assisted selection for seedlessness in grape breeding

Molecular markers associated with seedlessness are being tested on a set of germplasm consisting of both seeded and seedless grape cultivars as well as hybrid seedlings produced in the year 2012-13.

National Certification System for Tissue Culture raised Plants (NCS-TCP)

The samples of tissue culture raised banana plants provided by production facilities were tested for quality (genetic fidelity) using molecular markers following recommended standard operating procedures. About 110 samples from nine production facilities were tested and reports generated. Protocols for testing pomegranate samples were standardized in laboratory conditions.

Tissue culture

Doubled haploid production in wheat

With an objective to establish faster homozygosity in wheat hybrids/mapping populations, efforts are being made to develop doubled haploids production facility at the institute. Around two thousand wheat florets were crossed with different maize genotypes, which yielded about one thousand potential caryopsis. Percentage of embryos rescued was 0-29 %. Haploid formation frequency was up to 15 % (Figure 3).

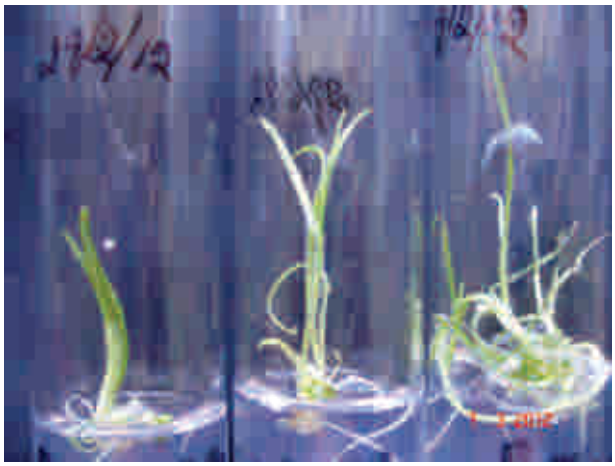


Figure 3 Haploid wheat plantlet obtained from wheat x maize growing in culture

Wheat improvement

Targeting bumper wheat production

Recently identified wheat variety MACS 6478 is the fourth variety identified by wheat workshop during past five years for timely sown irrigated conditions

Coordinated wheat improvement programme

A new wheat variety MACS 6478 was identified in 52nd All India Wheat Workers meet at CSAU&T Kanpur for timely sown irrigated conditions of the Peninsular Zone. MACS 6478 is highly resistant to both black and brown rusts under artificial conditions (highest ACI 10.2) and field conditions. MACS 6478 recorded overall

yield advantage of +4.3% over NIAW 917, +6.8% over GW 322 and +7.1% over MACS 6222. It has bold and lustrous grains with highest 1000-grain weight recorded 49 g, high protein content (14 %), better nutritional quality (Zinc 44.1 ppm, Iron 42.8 ppm), excellent chapati quality (score 8.05) and good bread quality (score 6.93), therefore, provides a better variety for consumers/ industries.

Based on the performance under coordinated trials in different zones, four entries were promoted to AVT first year. MACS 5022 was promoted to final year of testing under special trial for semi-dwarf dicoccums. Twelve entries were included in initial varietal trials (NIVT & Spl-trial-DIC) for further testing.

Station trials for wheat improvement

During 2012-13, total 379 entries were evaluated under replicated station trials of which 35 were significantly superior to checks and 111 entries were observed under first non-significant group. During current season, 385 cultures were tested under replicated station trials of which 170 were durums, 170 aestivums and 45 dicoccums. Of these, 130 were under rainfed conditions and rest 250 cultures were under irrigated timely sown conditions.

Breeding programme for wheat improvement

During 2013-14 crop season 238 crosses were attempted. These include 143 straight crosses and 95 back/ three-way crosses. Out of 139 straight crosses, 47 were among durums, 77 aestivums and 19 dicoccums. Under breeding material for irrigated and rainfed conditions uniform progenies were bulked in F5/ F6/ F7 generations. From 2012-13 crop season on the basis of plant type and rust reactions, 2626 progenies and 451 bulks were selected and sown for the current crop season.

Multilocational germplasm evaluation of wheat genotypes

This year we received 863 cultures for evaluation under multi-location germplasm evaluation from National Bureau of Plant Genetic Resources (NBPGR). Pathological observations were recorded for leaf rust and stem rust. A total of 215 cultures were resistant and 267 were moderately resistant to black rust while 176 were resistant and 89 were moderately resistant to brown rust. Overall, 217 cultures were resistant to both leaf and stem rusts.

Quality and pathological investigations

75 wheat grain samples were collected from mandies, farmers' fields of Pune, Satara and Ahmednagar and sent to Karnal for quality and disease analysis of Karnal bunt, black point, yellow berries etc. in harvested grains.

Wheat front line demonstrations (FLD) on farmers' fields

Frontline demonstrations were conducted on farmers' fields to evaluate the impact of latest improved varieties over the previously released/old varieties. During *Rabi* 2014 ten frontline demonstrations were sown in nearby villages of Hol and Songaon farm on 10 ha area. Improved varieties used were MACS 6222, MACS 6478 (aestivum), UAS 415 (durum) and MACS 2971 (dicoccum) against popular checks RAJ 4037, HD 2189, MACS 3125 and DDK 1029.

Wheat breeder seed programme

About 240 quintal of breeder seed was sold to different agencies during Rabi 2013. Breeder seed production programme of wheat varieties MACS 6222, MACS 2496, HD 2189, MACS 3125 and MACS 2971 was taken at Hol and Songaon farm on 8 ha area so as to achieve a target of 270 quintal for *Rabi* 2013

Public private partnership (PPP) and its impact

MOU was signed during August 2012 with ITC as PPP for rapid dissemination of technologies and helping for smooth flow of seed supply to industry. As a result, under the umbrella of ITC, Wheat Choupal Pradarshan Khets (CPK) were conducted in Karnataka state during *Rabi* 2013-14. About 1000 acre area is under MACS 6222 of which 500 acres is in Gadag district only. Farmers' mela was also organized at Karkikappa in Gadag district where plans for optimizing yield of MACS 6222 and farmers' queries were discussed. MACS 6222 showed its superiority in performance over rest of varieties in all respects and performed well even under three irrigations. This will help speedy spread of new varieties/technologies.

Improving leaf rust resistance and combating pathotype Ug99

Crossing programme was continued for improvement of leaf rust resistance in bread wheat variety MACS 2496. Seven wheat entries were found resistant to Ug99 at Ethiopia and Kenya.

Improving water use efficiency (WUE) and heat tolerance in wheat

Experiment was conducted at Hol farm during *Rabi* season for improvement in WUE and heat tolerance in wheat. Four wheat crosses involving progeny of adapted variety and WUE lines with heat tolerance were sown in rainfed as well as in restricted irrigation conditions. Different agronomy and physiological parameters, viz. early vigour, germination per cent, chlorophyll content, biomass, 1000 grain weight, yield etc. were recorded. Harvesting of these trials is completed and data is being analyzed.

Increasing the productivity of the wheat crop under conditions of rising temperatures and water scarcity in South Asia

Forty-eight wheat lines along with two Indian checks were sown in two replications. Different parameters were studied. Harvesting of this trial is completed. Observations on early vigour, germination per cent, chlorophyll content, CTD, NDVI, biomass, 1000 grain weight and yield etc. were recorded. Harvesting of these trials is completed and data is being analyzed.

Exploitation of interspecific biodiversity for wheat improvement

Twenty wheat lines along with five Indian checks were sown in two replications in rainfed and high flooded conditions. Different agronomy and physiological parameters such as early vigour, germination per cent, chlorophyll content etc. were recorded. Harvesting of these trials is completed. Wheat alien introgression lines have been received from Nottingham University during this season at DWR Karnal.

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

During *Rabi* season four experiments were conducted at Hol farm involving Australian wheat cultures. In the Hill plot trial C306 demonstrated exceptionally well for all traits. Besides, five high yielding genotypes and five low yielding genotypes along with two checks were selected for root coring in hill plot trial. Wheat genotypes having more root length, root diameter and root volume in the lower depths of the soil for rainfed conditions were successful in combating the early heat as the roots in the lower depth of soil contribute more to the grain yield. Deep sowing trials showed that genotypes responding positively to deeper sowing depths under early and late sown conditions could be utilized for improving root penetration and increasing productivity. Leaf vigour trials on genotypes which gave on par grain yield would be used in the breeding programme.

Soybean improvement

High yielding variety MACS 1188 released

Notification and release of soybean variety MACS 1188

A high yielding soybean variety MACS 1188 was released and notified for its cultivation in Southern Zone (Figure 4). This variety is resistant to major insect pests, diseases, and has pod shattering habit. This variety has yield potential of 25-40 q/ha.

Figure 4 MACS 1188

Screening of soybean for high oil content and earliness

Eleven MACS soybean lines showed more than 20% oil content. Maximum oil content (20.92 %) was seen in MACS 1473.

Station trials for soybean improvement

72 new elite breeding lines were developed and tested in three graded replicated trials. Of these, 65 lines gave significantly more yield than the control variety JS 335.

Evaluation in All India Co-ordinated soybean trials

On the basis of superior performance at different centers in respective zones, MACS 1340 was promoted to AVT-II in Southern zone whereas MACS 1407 was promoted to AVT-I of North Eastern zone while MACS 1416 and MACS 1394 were promoted to AVT-I of Southern zone. In the IVT conducted at Hol Farm MACS 1370 gave significantly the highest yield (4457 kg/ha) followed by MACS 1410 (4417 kg/ha) and MACS 1419 (4235 kg/ha). MACS 1416 recorded maximum seed yield of 3628 kg/ha in AVT I and MACS 1340 (3890 kg/ha) ranked first in AVT II at Hol farm.

Agronomy research in soybean

Foliar sprays of 2 % Na_2CO_3 and wheat straw mulching in soybean gave maximum yield than the other anti-transpirant sprays and without mulching. 100 % organic management produced higher seed yield of soybean than 100 % inorganic management and 50 % organic + 50 % inorganic management system. During *rabi* 2012-13, wheat with 100 % inorganic management system produced significantly higher soybean equivalent yield, net returns and Benefit:Cost ratio. Differences for mean seed yield in insecticide-herbicide spray combination were non-significant. Seeds treated with Neb 44 and application of RDF+Rhizobium produced maximum seed yield than Control+Rhizobium and RDF+Rhizobium treatments. In a demonstration on yield maximization with use of optimum package of cultivation recommended for the Southern Zone, newly notified soybean variety MACS 1188 and recently identified variety MACS 1281 gave seed yield of 3720 kg/ha and 3480 kg/ha when sown on 5th July. 100 % RDF+seed inoculation with PSB and rhizobium recorded significantly higher yield than other treatment combinations.

Entomology research in soybean

Entomological experiments indicated low to moderate infestation of tobacco caterpillar, leaf roller and stem fly. Categorization of the AVT test entries for resistance against stem fly revealed four entries to be highly resistant. On the basis of number of larvae/meter row length two entries were resistant to leaf roller. Five entries were identified as resistant high yielding (R-HY) entries. Tank mix combination of recommended insecticides and herbicides sprays on soybean showed low infestation of stem fly, leaf roller and tobacco caterpillar; weed intensity was low in the trial plot. Differences for seed yield were non-significant.

Soybean breeder seed production

A total of 36 quintal of breeder seed of soybean was supplied to public and private seed multiplying agencies and farmers.

Soybean front line demonstrations (FLD)

Ten front line demonstrations were conducted on farmers' fields in Satara district to demonstrate and evaluate the impact of improved technology (IT) over farmers' practice using MACS 1281, MACS 1188, MACS 450 and RKS 18 soybean varieties. Adoption of improved technology increased soybean yield compared to farmers' practice by 13 % and gave additional net returns of ₹ 6799 per ha.

Grape improvement

ARI-1308 grape hybrid tabled

Four hundred F_1 hybrid seedlings raised in hybridization programme during 2012-13 were ready for plantation in field. During current season, total 51 inter- and intra-specific cross combinations were attempted involving 25 cultivars and 11 existing hybrids as female parents to incorporate desirable fruit qualities and disease resistance. Pollen of 6 seedless varieties Jumbo, ManikChaman, Sharad Seedless, Sonaka, Sonaka super and Tas-A-Ganesh were used for direct and back crosses during this season and total 2500 seeds were harvested.

Out of fifty-nine hybrids evaluated for their fruit quality, hybrids ARI-80 (James/ Beauty seedless), ARI-181 (Concord/ Cheemasahebi), ARI-222 (Anab-e-shahi/ Catawba), and ARI-384 (James/ Sharad Seedless) showed better performance for bunch weight, TSS, berry size and weight. ARI-1308 (James/ Kishmish belli) produced yellowish green, spherical, seedless berries with high TSS (24^0 Brix) and this hybrid could be used for table purpose.

Developmental biology

Identification and characterizationof *VEGF* and *FGF* from Hydra

Significant findings on VEGF and FGF in hydra

Vascular endothelial growth factor (VEGF) and fibroblast growth factor (FGF) play important roles in the formation of the blood vascular system and in axon guidance, nervous system development and function.However, identification of homologues of *VEGF* and *FGF* from invertebrates that lack endothelial cells or blood vessels has led to re-appraisal of basic functions of these signaling molecules. Both VEGF and FGF pathways are well conserved at both nucleotide and amino acid levels from early metazoans to higher vertebrates. We have isolated and characterized*VEGF* and *FGF* homologues from *Hydra vulgaris* Ind-Pune, a Cnidarian which exhibits an organized nervous system and primitive epithelio-muscular cells. We detected expression of *VEGF* almost exclusively in the endoderm and of *FGF* in both ectoderm and endoderm through *in situ* hybridization of whole polyps and its transverse sections (Figure 5).

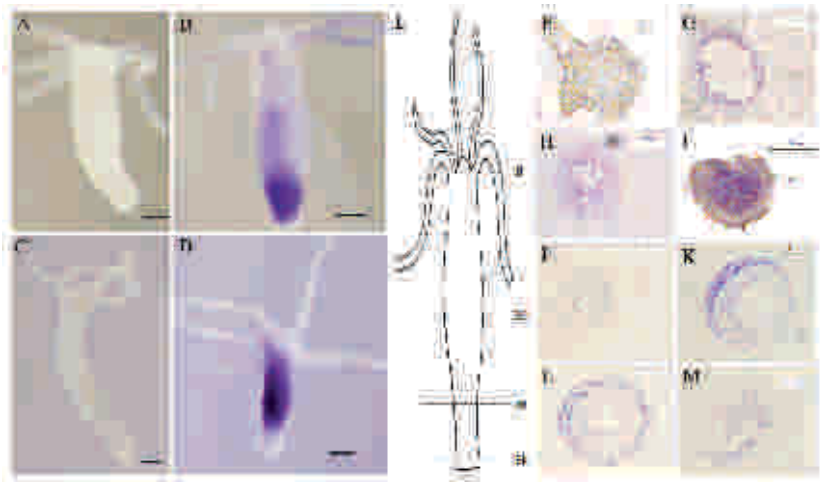


Figure 5 Localization of *VEGF* and *FGF* in hydra by whole mount *in situ* hybridization. Whole mount *in situ* hybridization with DIG-labeled *VEGF* anti sense riboprobes **(B)** shows expression in the endoderm of peduncle (1/3rd basal region), upper body column and tentacles. *FGF* expression is largely localized in the ectoderm of budding region and endoderm of tentacles **(D)**. **(A,C)** Hybridization with corresponding sense probes, for *VEGF* and *FGF*. Schematic representation of hydra showing levels of sections passing through hypostome (H), body column (BC), Peduncle region (PR) and basal region (BR) **(E)**. Transverse sections post *in situ* hybridization shows *VEGF* localization in the endoderm of body column **(G)**, peduncle region **(H)** and basal region **(I)** with clean ectoderm. *FGF* transcripts present in both ectoderm and endoderm layers of body column **(K)**, peduncle region **(L)** and basal region **(M)**. Clean hypostome indicates the absence of *VEGF* and *FGF* expression **(F,J)**. Scale bar, 100 mm. (From Krishnapati & Ghaskadbi 2013)

Treatment with a specific inhibitor of the VEGF receptor SU5416 did not affect the intact polyp (Figure 6) but did delay both budding and head regeneration, suggesting a possible role of VEGF in nerve cell development, tube formation and/or in branching.

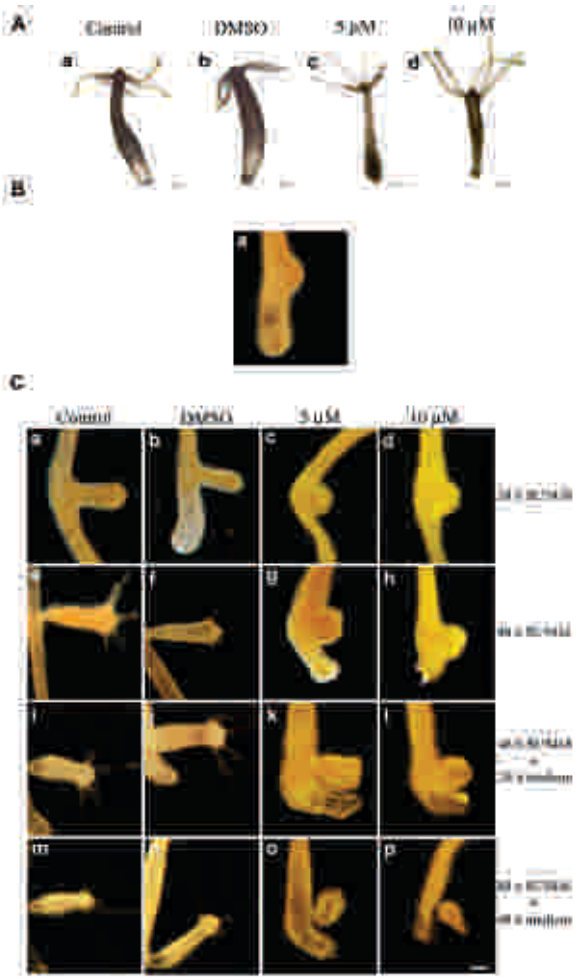


Figure 6 Inhibition of elongation of bud by SU5416. Adult non budding polyps were treated with 5 or 10 mM SU5416 for 48 h. No significant change was observed in adult hydra with this treatment (c,d) as compared to controls (a,b) **(A).** When adult polyps with stage 3 buds **(B),** were treated with 5 and 10 mM SU5416 for 24 h (c,d) and 48 h (g,h), a delay in the elongation of buds was observed as compared to the master controls (a,e) and DMSO controls (b,f). Normal elongation of the bud was not restored even after transferring the 48 h treated polyps to fresh normal hydra medium for further 24 (k,l) or 48 h (o,p) **(C)**. Scale bars in (A,C), 500 and 100 mm, respectively

In conclusion, VEGF signaling is important in branching and nerve cell development and appears to have originated in the ancestral cell type giving rise to endodermal cells in Cnidaria, since the epithelio-muscular cells observed in Cnidarians are reported to be homologous to smooth muscle cells that cover blood vessels in higher vertebrates. FGF could be important in stem cell maintenance and neural development in hydra in accordance with its role in axon guidance and neural development in other invertebrates. Our findings on VEGF and FGF in hydra are significant since these could help in designing strategies for identifying the evolutionary ancient functions of these, and probably other growth factors.

Structural and sequence similarities of Hydra Xeroderma Pigmentosum A protein to human homologue suggest early evolution and conservation

Presence of XPA gene in hydra – first report

DNA lesions caused by ultraviolet rays or by chemicals that distort its helical structure are repaired by the nucleotide excision repair (NER) pathway. The principal players of NER are the xeroderma pigmentosum (XP) group of proteins. One of the first members to come into play during NER is XP group A (XPA) protein. It binds to damaged DNA, verifies presence of a lesion, and recruits other proteins of the NER pathway to the site. XPA has not so far been reported from protozoa and lower animal phyla, though its homologues from yeast, *Drosophila*, humans, among others are well studied. Hydra is a fresh-water Cnidarian with a remarkable capacity for regeneration and apparent lack of organismal ageing. Cnidarians are among the first metazoa with a defined body axis, tissue grade organization, and nervous system. We report here for the first time presence of *XPA* gene in hydra. Hydra XPA shows a high degree of similarity to vertebrate homologues and clusters with deuterostomes in phylogenetic analysis. Homology modeling corroborates the very close similarity between hydra and human XPA (Figure 7). The protein thus most likely functions in hydra in the same manner as in other animals, indicating that it arose early in evolution and has been conserved across animal phyla.

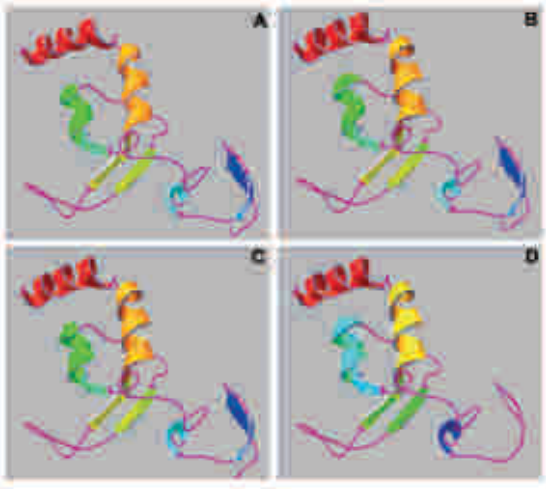


Figure 7 Putative structures of various XPA proteins (A) Human, (B) *Xenopus*, (C) *Drosophila,* and (D) hydra XPA proteins generated by Swiss Model show very high similarity to each other, indicating similarity in function and conservation through evolution (From Barve *et al*., 2013 b)

Neural development and disease

Molecular mechanisms that regulate neural development in fruit fly

One of the broad areas of interest is in understanding molecular mechanisms that regulate neural development in *Drosophila melanogaster* and particularly the role of glia in regulating some of these processes. Glia play important roles in processes such as axon guidance and fasciculation, synaptic pruning and synaptic transmission etc. Glia also have important roles in the maintenance of the nervous system by serving as immune cells of the brain and by forming the blood-brain-barrier. A disruption of these functions leads to dysfunction of nervous system.

An important function performed by glia is ensheathment, which serves to protect and helps compartmentalize the nervous system into distinct functional units. We are interested in signaling pathways that regulate cell shape change in glia during axonal ensheathment. We studied this in interface glia that ensheath the longitudinal tracts in *Drosophila* embryonic central nervous system (CNS). Fog encoded by the gene *folded gastrulation*, is one such secreted signaling factor that regulates the process of cell shape change in these glia.

In a genetic study aimed at identifying downstream interactors of Fog signaling, regulators of mitochondrial fusion and fission were identified as modulators of Fog signaling. Drp1 is a dynamin family protein that mediates mitochondrial fission while Marf is a mitofusin involved in mitochondrial fusion. The effect of overexpression of Fog was inhibited by knockdown *drp1* while the effect was enhanced upon overexpression of the same. The opposite result was obtained with *marf* suggesting that mitochondrial fission is an event downstream of Fog signaling. This was demonstrated in larval muscles where Fog overexpression was shown to cause fragmentation of mitochondria. The opposite effect was seen when Fog expression was reduced through expression of *fog*dsRNA (Figure 8). Expression of activated Concertina - a G-protein that signals downstream of Fog also produced mitochondrial fragmentation similar to Fog overexpression. The process of mitochondrial fission was found dependent on actin such that presence of stable actin inhibited Fog dependent mitochondrial fission. This work thus identified mitochondria as an unexpected player in mediating Fog signaling and it would be interesting to test if this pathway is conserved in Fog responsive cells other than those undergoing gastrulation.

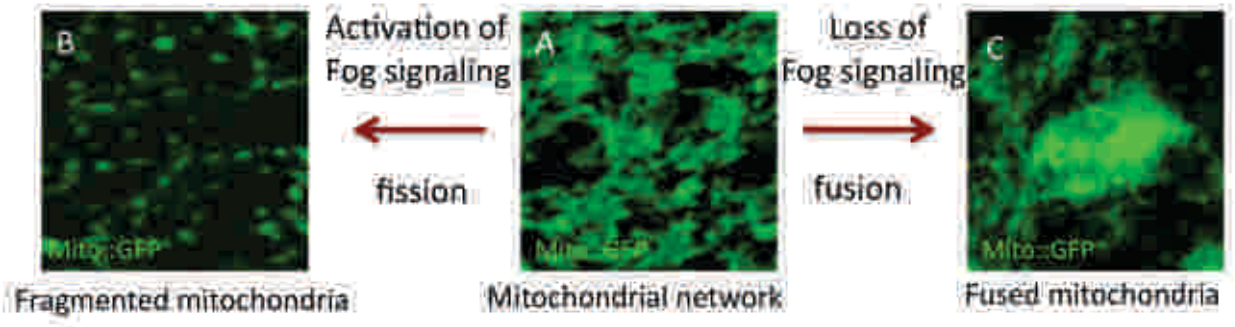


Figure 8 Effect of Fog signaling on mitochondrial morphology (A) A normal mitochondrial network seen in control animals visualized by expressing GFP targeted to mitochondria. (B) Overexpression of Fog leads to mitochondrial fragmentation. The mitochondria appear small and spherical. (B) Loss of Fog due to expression of *fog*dsRNA leads to mitochondrial fusion. The mitochondria appear as aggregates. (From Ratnaparkhi 2013)

To study genes that affect glial morphogenesis and development, it is necessary to develop tools that will assist in visualizing glia in various mutant backgrounds. We had cloned the 5' regulatory region of *fog* to generate a GAL4 line. Analysis of this line in embryos through immunostaining showed expression during early embryogenesis but not in the embryonic CNS. We simultaneously identified a regulatory region in the *heartless* gene that was cloned to develop a reporter line that would help visualize glia independent of the UAS-GAL4 system that is commonly used in *Drosophila*. This reporter line was generated and analyzed and found to express in embryonic glia. The expression in glia was seen from earliest stages of nervous system development.

Human nutrition in health and disease

Non-communicable diseases, new bio-molecules for nutraceuticals/pharmacological use, role of micronutrients in metabolic disorders are the research areas under which the following results were obtained.

Impact of maternal nutrition on the health of adult offsprings

The maternal deficiency during pregnancy and lactation and its effect on the adult offspring with respect to metabolic diseases is explored under this area.

Role of maternal calcium and vitamin D deficienciesin metabolic disease risk

Maternal calcium deficiency (CAD) and vitamin D deficiency (VDD) was introduced in female rats and the adult offsprings born to these dams were observed for metabolic syndrome. The blood parameters of the offsprings were monitored at the 10th, 18th and 30th week of their age (Table 2) and the histopathology was done (Figure 9).

Table 2 Blood parameters and histopathology

Blood parameter	CAD	VDD	Week
Serum HDL	higher	lower ($p<0.05$)	30
Insulin resistance	Higher ($p<0.05$)	lower	30
Hypertensive and insulin resistance	yes	yes	34
Histopathology			
Shrinkage of fat cells and necrosis	yes	yes	—
Ca deposition	increased	increased	—

It was found that the calcium and vitamin D deficiency in mothers during pregnancy and lactation dysregulates the metabolism of offsrings in adult life.

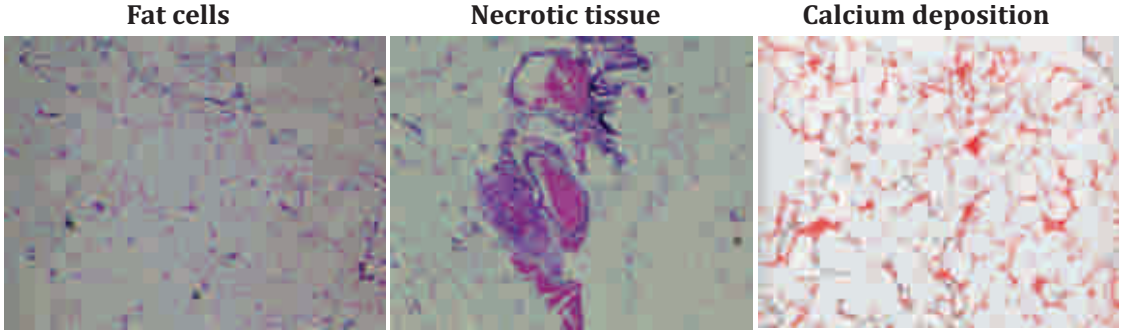


Figure 9 Adipose tissue abnormality observed in offsprings born to CAD and VDD mothers

Oral hypoglycemic proteins from *Costus igneus* (Koenig)

Protein isolated from plant resembles human insulin

The pharmacological potential of naturally occurring molecules and their derivatives as antioxidants especially against oxidative stress in non-communicable disorders is being explored under this programme. Functional foods and nutraceuticals are gaining importance in the management of metabolic disorders such as diabetes. Our project explores the oral hypoglycemic agents from *Costus igneus* and other plants known in traditional systems of medicine.

The plant *Costus igneus (C. pictus*) belongs to the family Costaceae. It is popularly known as insulin plant and is cultivated in the coastal area of Uttar Kannada district of Karnataka. In this area people traditionally consume few leaves of this plant twice a day for the management of diabetes. Since 1922 the plant is being explored for its insulin like proteins (ILP). In this study ILP was purified from fresh leaves of *C. igneus.* The purified ILP showed good glucose lowering property when fed orally to experimentally induced diabetic Swiss mice. Sequence analysis of the purified protein showed homology with heme binding domain of cytochrome b6f protein of *Costus* plant. It was observed that the mechanism of action of ILP isolated from *Costus igneus* is similar to human insulin.

Effect of ionizing radiations on copper binding properties of Aβ Peptide

To gain an insight into the copper binding properties of the oxidized amyloid beta (Aβ) peptide, we carried out oxidation of Aβ peptide, using pulse radiolysis. We found that the reaction of hydroxyl radicals with Aβ peptide produced oxidized, dimeric and trimeric forms which bind copper and produce deleterious free radicals.

Hepcidin- a possible indicator for assessing iron status

Iron supplementation to be designed carefully

Blood samples of 174 subjects were analyzed for various biochemical parameters like serum iron, hepcidin, total iron binding capacity (TIBC) and ferritin along with inflammatory markers like TNF. We compared mean of these biochemical parameters among anemic and non-anemic subjects (defined using WHO cut-off values).

Our results demonstrated that in the population under study there is higher incidence of inflammation hence iron supplementation should be carefully designed by correcting for higher inflammation and hepcidin values.

Microbial processes

Biological hydrogen production

Process developed for biohydrogen production from distillery waste

The strain DMHC-10 isolated in this laboratory is a highly active hydrogen producing anaerobe. Polyphasic identification of the strain DMHC-10 was completed along with its closest phylogenetic match *Clostridium acetobutylicum* ATCC 824^{T}. It revealed that the strain DMHC-10 is a novel species of *Clostridium* and is designated as *Clostridium biohydrogenium* sp.nov. The strain DMHC-10, the type strain of the new species, is deposited in MCM under accession number MCMB 508. The whole genome sequence analysis of the novel species was done in collaboration with MCC-NCCS, Pune. The genome analysis was useful to guess possible enzymatic pathways in the metabolism of glucose and hydrogen formation by the novel species.

Using the strain DMHC-10 a process was developed for biohydrogen production from distillery waste. The process could be run efficiently at 1 or 2 day HRT but was more stable with 2 day HRT at which average bio-H_2 production yield was 5±1 M^3/M^3 waste/day corresponding to 1163 L bioH_2/ kg COD reduced/ day with 87±3 % hydrogen at 28-32 $^{\circ}$C.

Using the novel anaerobic bacterium *Clostridium biohydrogenium* a biotechological process was developed for production of biohydrogen from distillery waste having high COD. The patent application is filed.

Development of a two stage anaerobic bacterial process for butanol production from industrial waste

Out of total 318 anaerobic bacterial isolates, through primary and then secondary screening, clostridia isolates DMHC-10 and BMAS-2 were selected for butyrate production from glucose and starch, respectively. Another isolate CHTa was selected for butanol production. The isolate DMHC-10 gave 5.1g/l n-butyric acid from 18.72 g/l glucose in 24 h. Isolate CHTa produced 7.7g/l butanol in 72h from 42 g/l glucose. For best butyrate production optimum temperature, pH and glucose concentration for DMHC-10 was found to be 37^{0}C, 6-6.5, 6% and for BMAS-2optimum temperature, pH and starch concentration was found to be 45^{0}C, 6, 6%, respectively. With isolate CHTa, the optimum temperature, pH and glucose concentration were 37^{0}C, 6.5-7 and 8%, respectively. Using DMHC-10 or BMAS-2 and CHTa production of butanol in two stages from industrial waste water is being studied. With distillery waste, in stage I butyric acid was produced on inoculation with strain DMHC-10. The butyrate rich waste was then inoculated with strain CHTa to produce butanol in stage II. Preliminary experiments have shown the feasibility of process.

In secondary screening, BMAS-2 and CHTa were selected for starch to butyric acid and butanol production, respectively. Optimum temperature, pH and substrate concentration were determined for BMAS-2 and CHTa culture. For BMAS-2 isolate optimum temperature, pH and starch concentration were 45 ^{0}C, 6 and 6 % starch concentration, respectively. In case of CHTa, optimum temperature and pH were 30°C and 6.5

respectively. Feasibility studies of industrial waste to butanol production were carried out by CHTa culture. Seven different industrial wastes (deoiled cakes of Karanj, Castor and Hinitro), corn starch industry wastes (CSL and ETW) and sago starch industry wastes (SEST and SSW) were collected from four different industries. Chemical composition of all these wastes was determined to check the availability of utilizable substrate. Among all these waste, solid sago waste (SSW) showed maximum carbohydrates (82.7 g %) and starch (77.4 g%) in it. In feasibility studies, CHTa culture showed maximum butanol production in solid sago waste, i.e. 7.83 g/L with yield of 0.26 g butanol per gram of total carbohydrates utilized in 96 h.

Pharmacological aspect of actinokinase enzyme

In vitro clot lysis was performed using blood clot prepared in capillary tubes and clot lysis using actinokinase enzyme was monitored at intervals.

In a petri dish 10 mM phosphate buffer pH 8 was added. Clotted capillary was dipped in it. 50 µg fibrinolytic enzyme was added and the petri plate incubated at 37 ^{0}C. Blood clot lysis was examined at an interval of 1 h and incubated further for 24 h along with control. The lysis of the clot inside the capillary was observed after 1 h and complete clot lysis was observed after 24 h (Figure 10). It was found that the enzyme works effectively in the capillary. Hence it could work similarly in a pathological vein or artery.

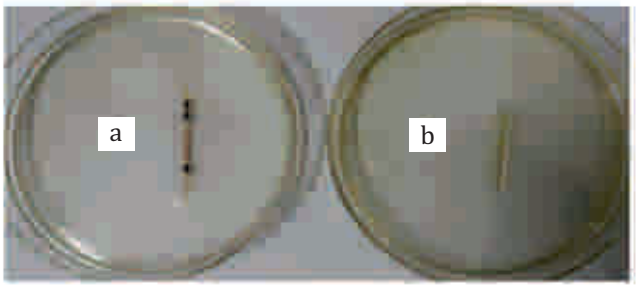


Figure10 *In vitro* clot lysis inside the capillary tube using actinokinase enzyme a) control b) test

Resistant starch enriched prebiotic supplement for inflammatory bowel disorder

Use of prebiotics, and resistant starch (RS) in particular, having anti-inflammatory properties could be possible treatment for inflammatory bowel disease (IBD). The hydrolysis of prebiotics and resistant starches by intestinal microflora leads to formation of volatile fatty acids which possess anti-inflammatory properties. Acute colitis in swiss mice was induced by giving 3 % dextran sodium sulfate (DSS) in drinking water for 7 days. Animals were then submitted to a 7 days recovering period with DSS treatment in order to analyze healing effects of the diets, viz. 1) standard drug (Mesacol 10.0 mg/kg body weight), 2) B-RS enriched diet, 3) C-RS enriched diet, 4) M1-RS enriched diet and 5) mixed RS enriched diet. There was a significant increase in colon weight and cecum weight of RS supplemented group as compared to other groups. The [illegible] 4 groups p> 0.06, C-RS>B-RS>M1-RS>Mix-RS as compar[illegible]6) and cholesterol level (7.9 %) decreased in B-RS suppler[illegible]se in IFNγ levels in mixed RS enriched diet group (Figure [illegible]ndicating positive effect on IBD.

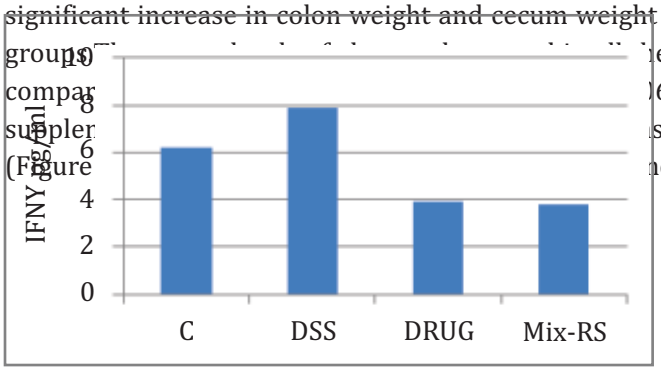


Figure 11 Effect of resistant diet on serum IFNγ levels in IBD induced mice

Nanobioscience

The objectives of nanobioscience research are nanobiotechnology for the improvement of agriculture, human health, and environment. Research leads during the year in the areas of nanomedicine, nanodiagnostics and agricultural nanotechnology are summarized below.

Nanomedicine

Antidiabetic activity of zinc oxide nanoparticles: Studies on mechanism of action

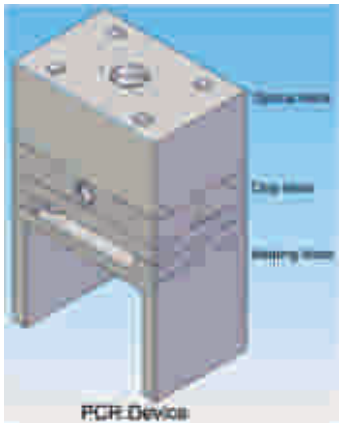
Glucose lowering ability of ZON demonstrated

Earlier studies carried out in type 1 and type 2 diabetic rats have demonstrated good glucose lowering ability of zinc oxide nanoparticles (ZON) and that these nanoparticles cause pleiotropic effects. Now the detailed studies on the mechanism of anti-diabetic action of zinc oxide nanoparticles are being carried out *in vitro.* Beneficial effects of zinc oxide nanoparticles on oxidative stress parameters (SOD, catalase, GSH) in RIN5f and HepG2 cells were demonstrated and the cell death seen at cytotoxic doses of ZON is apoptotic as evidenced by TUNEL assay and DNA fragmentation. The effects of ZON on RIN5f cell proliferation were studied in which cells were exposed to ZON for 24 h. Post-exposure cells were then stained immuno-histochemically with Ki-67 antigen, a marker of cell proliferation. Cells were counter-stained with hematoxylin for easy visualization. For comparison, insulin (0.1 IU/ml) treatment was used as positive control. Proliferative effect of ZON was observed as indicated by enhancement in the Ki-67 antigen stain.

Nanodiagnostics

Disposable microfluidic chip suited for DNA amplification by polymerase chain reaction

PCR device designed in-house



Polymerase chain reaction (PCR) technology is valuable in molecular biology to produce copies of DNA for applications ranging from genotyping to sequencing. As part of the study a PCR chip was fabricated using PDMS (polydimethylsiloxane) elastomer by soft lithography. The complete PCR device was designed in-house. It is being tested for carrying out amplification of DNA with the aim of developing a functional diagnostic device (Figure 12).

Figure 12 Miniature PCR device

Development of field-usable diagnostics for viral disease affecting aquaculture

Viral diseases are a continuous threat to aquaculture industry and white spot syndrome virus (WSSV) is one of the most prevalent infectious agents. Diagnostic methods for rapid and efficient detection of viral pathogens at early stages of disease are required to minimize economic losses due to infections.

Viruses offer certain advantages over standard antibodies such as high stability of phage proteins, ease of amplification and storage over long time periods. Hence bio-panning was performed against VP28 to obtain phage displayed peptides for recognition of WSSV. Phages displaying the peptide sequences TFQ AFD LSP FPS and ISS PRS APT PPY occurred at high frequencies and were used successfully in phage ELISA. Nanoparticles based field-usable diagnostics are being developed either as flow-through immunoassay or lateral flow assay.

Agricultural nanotechnology

RNA interference for insect control

The insect pest *Helicoverpa armigera* or armyworm causes severe damage to crop plants and is resistant to chemical pesticides, which also causes environmental damage. Therefore there is a need for newer strategies. RNAi has potential applications for insect control due to its high specificity. Presently, effective dsRNA delivery is considered the bottleneck for application of dsRNA in insect control. Nanoparticles are an alternative delivery system for RNAi that protect the siRNA from degradation. The natural glucosamine biopolymer, chitosan, a cationic deacetylated derivative of chitin, is biocompatible and has affinity for nucleic acids. Our experiments demonstrate that chitosan nanoparticles can be used as a vehicle for delivery of dsRNA and can be effective in insect control (Figure 13).

Figure 13 RNAi in insect control

Helicoverpa 2nd instar larvae (1) control, (2) dsRNA treated, (3) chitosan nanoparticles – dsRNA treated against juvenile hormone methyl transferase

Enhancing germination efficiency in medicinal trees

Dormancy, poor and erratic germination and slow growth of seedlings are major difficulties in propagation of medicinal trees via seed. Natural reseeding is inadequate to guarantee plant survival and hence methods for enhancing seed germination efficiency are being developed.

In the present report effects of nanoscale zinc oxide on germination of *Aegle marmelos*, *Bauhinia variegata* and *Sterculia urens* seed are presented. Seed treatment with zinc oxide (bulk) is included for comparison. *Aegle marmelos* seeds treated with nano and bulk zinc oxide particles showed marginal increase in seed germination, with insignificant differences in mean germination time and higher germination speed indicating acceleration in germination rate. In case of *Bauhinia* and *Sterculia* a significant increase in germination percentage was observed. Treatment had no adverse effect on speed of germination and relative growth index was found to be high in ZnO nanoparticles treated seeds. Treatments led to increased seed surface roughness as evidenced by scanning electron microscopy, which could have contributed to higher moisture retention leading to increased germination.

Natural product chemistry

Pancreatic lipase inhibitory activity of *Heterodermia incana*

Obesity is a known health condition and the prevalence is rising globally. Several processes are involved in obesity associated oxidative stress, caused by an overload of nutrients and particularly high fat, high-carbohydrate meals. The widely prescribed lipase inhibitor orlistat has been shown to benefit in weight control in obesity. However, orlistat induces the gastrointestinal side effects which may cause premature withdrawals. To search for new sources of lipase inhibitors, we investigated antioxidative and pancreatic lipase inhibitory activity of *Heterodermia* lichen species as it is traditionally used as a spice and flavouring agent for meat and vegetables. Hence the experiment was conducted on thallus of lichen *Heterodermia incana*. Methanolic fraction showed 52.6-68.5% antioxidative and pancreatic lipase inhibitory activity. Isolated lichen metabolites atranorin showed 21.9-35.2% and zeorin 44-57.8 % activity. The above activities were found higher or equivalent to the standard antioxidant and lipase inhibitor.

Antioxidant potential of endophytic fungi

Antioxidant property of ethyl acetate extract of endophytic fungus *Colletotrichum* sp. isolated from *Polygala elongata* was evaluated *in vitro* by using DPPH and ABTS radicals and by phosphomolybdenum method. Antioxidant components like total phenol and flavonoid were determined and were found to possess potential antioxidant activity.

Standardization of medicinal plants

HPTLC profile library of Phytochemical Reference Standards (PRS)

This project aims to develop PRS library by HPTLC profiling for selected Indian medicinal plants. Standardization of mobile phase for selected PRS is a continuous process. The spectra library will be useful for standardization of medicinal plant resources. So far 15 PRS were standardized and documented.

Evaluation of antioxidant potential from plant resources: Fruit and vegetable juices

Antioxidant potential

Triphala formulation in different forms, viz. juice, tablet and churna, and its ingredients was evaluated for comparative antioxidant study. The results show that the antioxidant potential is directly proportional to their phytochemical content values.

Phytochemistry

ARI proposes, ICMR accepts

Phytochemical Reference Standards of Medicinal Plants

Phytochemical Reference Standards (PRS) are important for the chromatographic characterization of plant

extracts. Eight PRS Cajanol, d-Fenchone, Harmaline, Maslinic acid, Norepinephrine, Pulegone, Randialic acid and Xanthinin were isolated by using standard procedures and characterized by recording the physical and spectral data. The finalized monographs were accepted by Indian Council of Medical Research for publication.

Quality standards of medicinal plants

Monographs on the quality standards of *Acacia farnesiana* (Linn.) Willd., *Argemone mexicana* Linn., *Getonia floribunda* Roxb., *Glycine max* (Linn.) Merr., *Manihot esculenta* Crantz, *Raphanus sativus* Linn., *Sphaeranthus indicus* Linn. and *Tectona grandis* Linn. f. submitted to Indian Council of Medical Research were published in Volume 12 of Quality Standards of Indian Medicinal Plants by Indian Council of Medical Research.

Semiochemicals

Attractant and repellent – two sides of the same chemical

Plant

Studies on the development of attractant/ repellent formulations from the roots of plant *Swertia densifolia* were continued. Essential oil from the roots was isolated. GC-MS analyses of the essential oil indicated the presence of 25 compounds which were identified subsequently. The quantitative analyses were done and the percentages of the individual compounds were determined.

Honeybee

Bioassay of all the essential oils was carried out on the honeybee *Apis florea*. Rotating table bioassay was used. It was observed that the number of honeybees hovering over the dish containing the test formulation was much less than that of the control indicating its repellent nature. Availability of repellent formulations for honeybees is useful for better bee-management.

Beehive

Propolis is a beehive product used in folk medicine. However, its composition and properties vary widely. Anti-inflammatory and anti-oxidant activities of Indian propolis were demonstrated. Purification of the crude propolis extract was carried out by chromatographic methods. This led to isolation of 13 known compounds and a new compound. Structures of the known compounds were assigned by comparing their physical and spectral data with those reported in literature. Structure of the new compound was elucidated as '2-Methoxy-5-(1-phenyl-2-propylene)-[1,4]-benzoquinone'.

Quinoline and quinoline annulated derivatives

Environment-friendly synthesis of biomolecules

Quinoline derivatives were synthesized by Friedlander reaction using 2-amino acetophenone and active methylene compounds. None of the compounds characterized and tested showed significant antioxidant activity.

Palaeobiology and Palaeontology

Ichnology

India – oldest record of trace fossil *Hillichnus*

Upper Jurassic rocks of the Marwar Basin, Rajasthan

The Upper Jurassic of Marwar basin consists of two formations - Baisakhi Formation and Bhadasar Formation.

The exposures of Baisakhi Formation were examined near villages Baisakhi, Jajiya, Lodharva, Chaudharia, Kathori, Rupsi, Lanela, Khabia, Khaba and Baramsar. A traverse west of Chattrel village revealed excellent exposures of Bhadasar Formation (Figure 14a).

Contact between Jaisalmer Formation and Baisakhi Formation is marked by presence of a polylithic conglomerate with extrabasinal elements overlying a bioeroded hard ground. The exposures were studied near and west of village Baisakhi. Presence of a hardground associated with an overlying conglomerate unit suggests a non-conformable contact.

A distinct change in lithology was noticed within the Baisakhi Formation. Based on lithology this formation is divided into 3 units/ members. As far as the ichnofauna is concerned all the members/units of Baisakhi Formation show presence of biogenic structures. Occurrence of ichnogenera *Planolites, Cosmorhaphei*

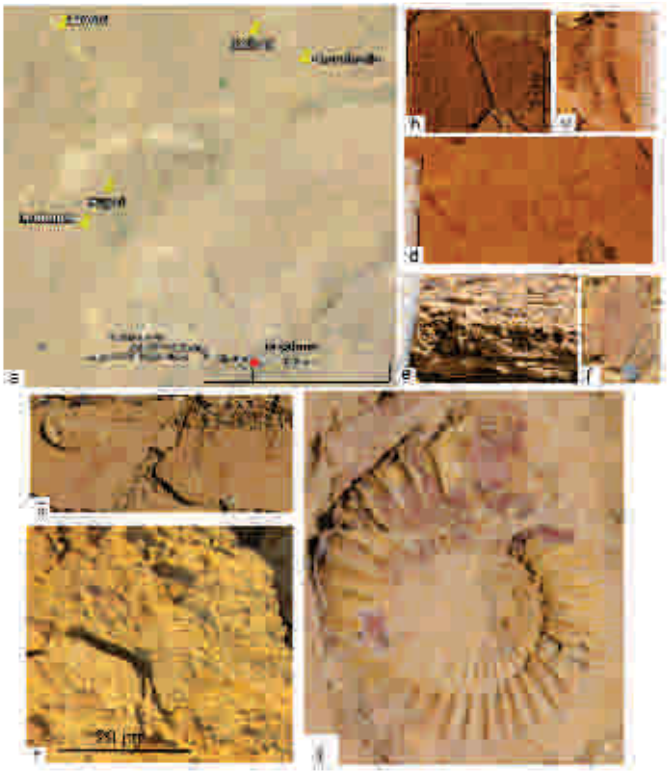


Figure 14

a. Map showing exposure of Baisakhi Formation and Bhadasar Formation.

b. Meandering trails of *Cosmorhaphe*i sp. From the lower unit of Baisakhi Formation examined near the village Chaudharia.

c. *Nereites imbricata* noted in lower unit exposed of Baisakhi Formation near Chaudharia.

d. *Nereites cambrensis* recorded within the lower unit of Baisakhi Formation exposed near Chaudharia.

e. Well-developed *Teichichnus* isp. in middle unit of Baisakhi Formation

f. *Zoophycus* isp. found in middle unit of Baisakhi Formation.

g. *Rhizocorallium* isp. recorded in middle unit of Baisakhi Formation.

h. Presence of abundant *Taenidium* in the Baisakhi Formation exposed near village Lanela.

i. Excellently preserved ammonoids from the Bhadasar Formation near west of Chattrel village.

(Figure14b), *Nereites imbricata* (Figure14c), *N. biserialis* (Figure 14d), *Gyrochorte comosa, Rhizocorallium* etc. was noted near Chaudharia. Exposures of middle member near village Kathori show presence of ichnogenera *Taenidium, Teichichnus* (Figure 14e), *Rhizocorallium* (Figure 14g) and *Gyrochorte* in ascending order from base to top of studied section. Whereas, beds towards top of this unit at Rupsi are abundant in ichnogenus *Zoophycus* (Figure 14f) accompanied by *Rhizocorallium*. Thinly bedded calcareous horizons of the upper unit exposed near Lanela show presence of abundant *Taenidium* (Figure 14h).

Exposures of Bhadasar Formation west of Chattrel village exhibit two types of lithology, viz. sandstones and fossiliferous grits. In a sandstone dominated lithology presence of burrows was noticed whereas the fossiliferous grit beds show abundant, excellently preserved ammonoids (Figure 14i).

Studies on the complex bivalve trace fossil *Hillichnus* pointed out that *Hillichnus* is interpreted as resting, locomotion and feeding traces of bivalve of tellinaceans superfamily. Hence these traces are evidence to presence of tellinaceans in the Jaisalmer Formation. India can be considered as the oldest record of *Hillichnus lobosensis.*

Sequence stratigraphy - Cretaceous, Cauvery Basin, Tamil Nadu

Depositional history through an integrated approach

Detailed field traverses were carried out to understand the Uttatur-Trichinopoly-Ariyalur Group contacts. Observations, measurement and sample collection of sediments from the Trichinopoly and Ariyalur Groups were also undertaken. An integrated ichnological and sedimentological approach was used to determine the environment of deposition of the Karai Formation and to build its depositional history. The ichnofaunal succession, change in gross lithology, fauna and associated primary sedimentary structures suggest a shift from distal *Cruziana* ichnofacies to *Skolithos* ichnofacies indicating a shallowing depositional trend from middle/ outer neritic to shoreface environment. The Uttatur-Trichinopoly Group contact was interpreted to be a complex combination of a subaerial unconformity (SU) and a transgressive wave ravinement surface (WRS). Presence of gravity flows, mainly sand prone were noted at several stratigraphic intervals of the Late Turonian–Santonian sequence. The attitude of some of these channels, their orientation, dimensions, lithological variations and ichnofauna was noted during field studies (Figure 15).

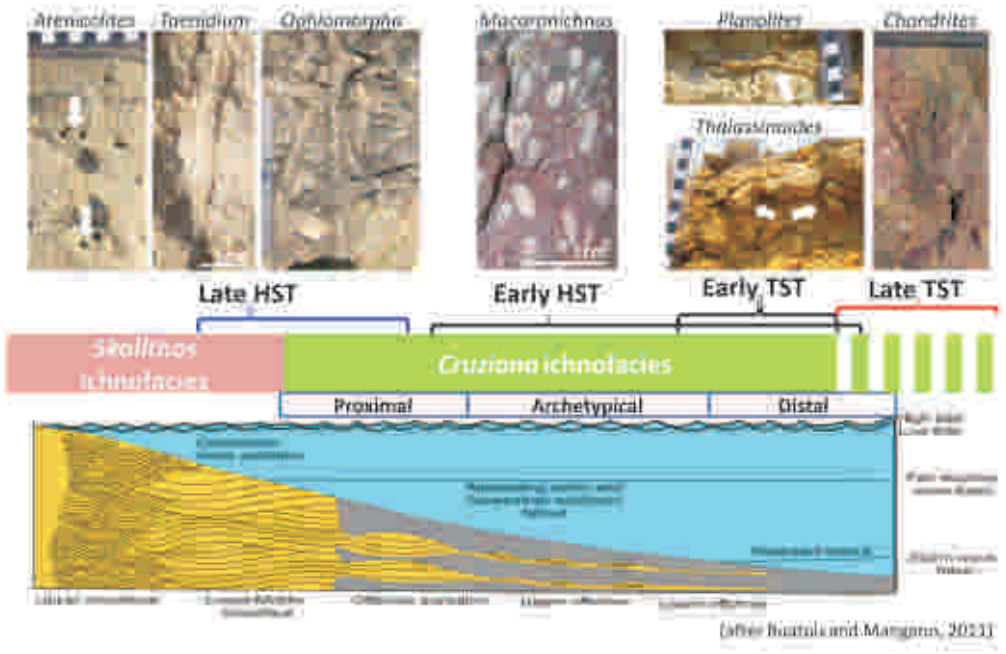


Figure 15 Ichnofauna, palaeoenvironment and depositional history of the Karai Formation

Cyanobacteria as biomarkers of hydrological changes in the Late Quaternary deposits of South Western India

Central Kerala wetlands – excellent archives

The wetlands of central Kerala have been found to be excellent archives of signatures of cyanobacteria besides the conventional terrestrial organic matter of pollen, spores etc. Well preserved morphotypes of *Gleotrichia* and *Rivularia* are the best forms of cyanobacteria found in almost all the studied profiles. Some of these are found to be indicative of ecological shifts and as such can be used to distinguish palaeoecological and palaeoenvironmental scenarios during the depositional regimes. High proportion, well preserved and larger morphotypes of cyanobacteria are found to be good indicators of the hydrodynamic regimes associated with relatively wet period as a result of higher freshwater influx towards the sedimentary environment. This is correlated with the terrestrial input as indicated by available palynological data. The organic accumulation in terms of cyanobacterial occurrence and terrestrial input of palynological data indicates that the hydrodynamics of the Early to Middle Holocene during the evolution of the various wetlands has been highly active and can be correlated with the Holocene Climatic Optimum (8 k yrs BP - 5 k yrs BP) when the SW monsoon activity was much higher.

The scarcity and absence of cyanobacteria towards Late Holocene in most of the studied boreholes except that of profiles from Sasthamkotta and Ashtamudi Lakes reflect the hydrodynamic regimes controlled by relatively reduced rainfall of the Late Holocene (< 3 k yrs BP). Since the Sasthamkotta and Ashtamudi Lake systems are also affected by local hydrological regimes due to local freshwater streams, the cyanobacterial diversity and their proliferation even continued towards Late Holocene. Therefore, relative abundance of cyanobacteria and their proliferation is directly related to freshwater influx of the rainfall as well as the local hydrological regimes associated with the active aquifers controlled by the geomorphological feature of the regions in which the wetland system sustained.

Environmental significance of intertidal mangrove foraminifera of Coastal Maharashtra: Monitoring threatened ecosystems

Foraminifera, diatoms, heavy metals as environmental indicators

Dwindling fish-catch and diversity, as well as repeated incidents of fish mortality, have put an end to the fishing industry in the Vasishthi Estuary since two decades. In order to assess the health of the estuary and identify the cause/s for the same, spatial distribution of foraminifera, diatoms and heavy metals were

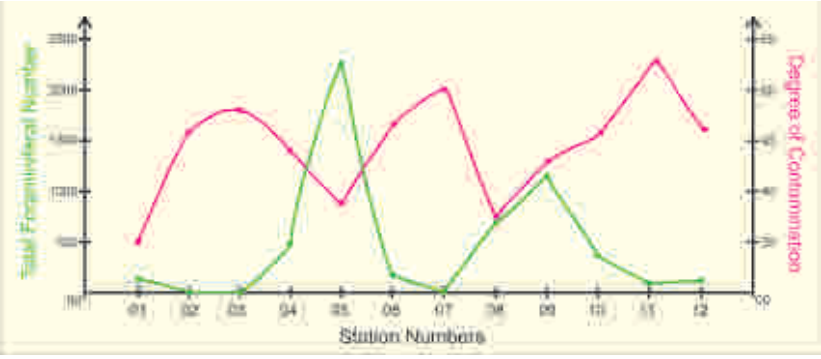


Figure 16 Inverse relationship between the foraminiferal abundance and degree of contamination in the estuary

studied in the benthic sediments collected along the length of the estuary. The foraminiferal (78 benthic species) and diatom (36 species) diversity as well as their abundances in the Vasishthi estuary are quite high as compared to those previously reported from the estuaries from the West Coast of India. This is also proven by the proliferation of species tolerant to high concentration of nutrients in the estuary. The abundance of certain diatom species also suggests heavy metal toxicity in the environment. The geo-accumulation index and enrichment factors are suggestive of significant Cu enrichment and strong pollution in the estuary. Though each of the remaining heavy metals, namely Mn, Co, Ni, Cr, Zn, Pb and Cd show moderate levels of contamination, their combined degree of contamination is indicative of extremely strong levels of toxicity in the estuarine environment. The geo-accumulation index is suggestive of non-anthropogenic sources of pollution. Foraminifera which have been reliably used as environmental indicators for more than half a century too show a very good correlation with the toxicity in the Vasishthi Estuary (Figure 16).

Study of biogenic sedimentary structures from Kundalika estuary and adjacent sandy shores

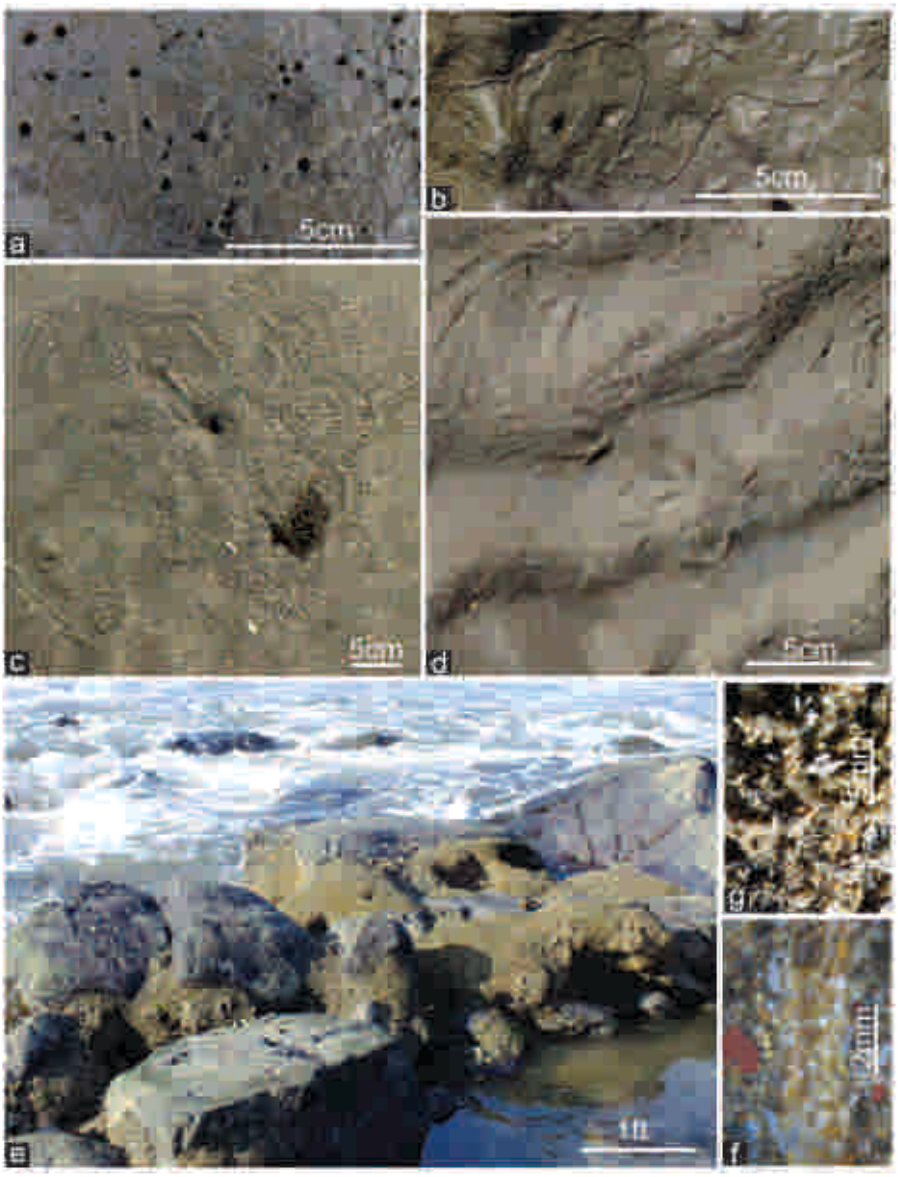


Figure 17

a. Burrows of polychaetes on estuarine tidal flat.

b. Sea slug trail.

c. Trail of hermit crab.

d. Foot prints of Sand Plover birds.

e. Sand reefs at Kashid beach

f. Thin section of tube under microscope showing internal structure.

g. Close up of individual tube.

[Note: Preferential arrangement of sand grains and shell fragments in (fig. f) and (fig. g).]

Sand reefs as dwelling structures

A preliminary study of biogenic sedimentary structures on tidal flats and beaches in and around Kundalika estuary was carried out. It was observed that their variation and diversity is dependent upon the sediment type and cohesiveness (Figure 17a-d). Grain size analysis of non-bioturbated and bioturbated samples from mud flats revealed bioturbation causes its textural change.

Unique biogenic structure known as sand reefs are found on sandy shores of the study area (Figure 17e). These sand mounds show explicit architecture. Sand reefs, at first glance, appearing as rough sand mounds, are actually dwelling structures of polychaetes of the genus *Sabellaria.* Internal morphology of these sand tubes shows *en-echelon* as well as interlocking alignment of shell fragments and grains (Figure 17f). These particles show specific orientation. The smooth faces of grains are aligned on inner side of tube and their rough faces on outer side (Figure 17g). Proteinaceous glue secreted by polychaetes serves as adhesive to hold the sediment particles in place.

Virology

Study of bacteriophages of certain *Salmonella* spp.

In this study we are interested in isolation of new *Salmonella* phages, studying diversity of phages and examining them for properties which may be useful for bio-control in food industry, poultry and environmental applications.

To differentiate bacteriophages, Restriction Fragment Length Polymorphism (RFLP) analysis was performed. V234 (bacteriophage against *S. typhi* O), V200 and V263 (bacteriophages against *S. typhimurium*), P22 (standard bacteriophage against *S. typhimurium*), V89, V90 and V468 (bacteriophages against *S. enteritidis*), V224, V277 and V553 (bacteriophages against *S. gallinarum*) were analyzed by RFLP. RFLP analysis showed that V553, V277 and V224 are different though they infect the same host. On the other hand V200 and V263 showed similar RFLP patterns.

Bacteriophages against typhoid causing organism

Recently outbreak of typhoid was reported in Rajgurunagar near Pune. Samples were obtained from the Bhima river, at Rajgurunagar. Bacteriophages were isolated from these samples. Six different *Salmonella* spp. were used for isolation of bacteriophages, viz. *Salmonella typhi* 'O', *Salmonella paratyphi* A, *Salmonella paratyphi* B, *S. typhimurium, S. enteritidis, S. gallinarum*. Total of 16 bacteriophages were isolated against the *Salmonella typhimurium* with plaque diameters ranging from pinpoint to up to 5mm. Characterization of these phages is in progress.

Lytic bacteriophages

Previously we studied the host range and thermal stability study of bacteriophage V2058 (bacteriophage isolated against *Klebsiella pneumoniae*). Effect of pH on the stability of V2058 was studied at pH range 2-7. V2058 was stable in pH range 3-7. Host range was studied for bacteriophages V2077 isolated against *Escherichia coli* (V1089), V2078 isolated against *E. coli* (V1089) and V2079 isolated against *E. coli* (V1090). In host range study it was indicated that bacteriophage V2077, V2078 and V2079 have narrow host range. This limited host range can be advantageous for phage therapy.

Annexure

Repositories

Agharkar Herbarium at MACS (AHMA)

One thousand specimens were added to AHMA after their taxonomic scrutiny, updating nomenclature and entries on cards, register, and database. These additions are done through routine botanical excursions, specimens received from Dr VD Vartak's personal collections, specimens deposited by Ph. D. students and RGSTC project. Additionally 2500 herbarium scans were added to the database. Presently the total number of specimens in AHMA database is 28,500.

Ajrekar Mycological Herbarium (AMH)

The total herbarium samples has reached 9652. Total 74 fungal specimens were received from different centres and included holotype specimens.

Animal House

ARI has an animal house facility to meet the standard requirement of rodents. It is registered under CPCSEA for animal breeding and experimentation since 1999. The Institutional Animal Ethics Committee regularly arranges meetings and approves research proposals with full consideration to animal ethics. Currently strains of laboratory rat and mice are maintained at standard environmental conditions under the supervision of experienced and trained staff. Quality animals are supplied for in-house research work.

Crude drug repository

The repository was enriched through addition of 112 new specimens which include genuine field samples and voucher deposition under various projects taking the total number of accessions to 909. Additions were classified according to the plant parts, and preserved in the repository.

Fossil repository

Fossil repository hosts 7895 specimens of plant and animal fossils. These include ammonoidea, bivalvia, gastropoda, bryozoa, echinoidea, foraminifera, trace fossils, plant fossils, pollens and spores collected from various localities from Peninsular India.

MACS Collection of Microorganisms (MCM)

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

National Fungal Culture Collection of India (NFCCI) - National Facility

After verification of taxonomic identity, fungal strains were deposited in NFCCI. As part of conservation of fungal diversity, live, pure and authenticated cultures of 307 interesting fungi were added. The total number of fungal cultures comes to 3338. The fungal germplasm are maintained by standard long term preservation methods like freeze drying, liquid nitrogen, glycerol and distilled water.

Library and Information Centre

The library is a part of CSIR-DST consortium known as National Knowledge Resource Consortium (NKRC). It has provided access to several international online Full Text resources as well as to Databases like Web of Science, SCOPUS. Current holdings of the library are:

Particulars	Total	Particulars	Total
Books/Bound Volumes	26607	Maps and Atlases	562
Reference Books	1104	Microfilms/Fisches	636
PhD Thesis	285	Annual Report	443
MSc/ MPhil Thesis	96	Journals	209
ARI Reprints	2845	Digital collection/ Documents	3050

Services Rendered/ Offered

Crude drug authentication service Total 263 authentication reports were generated. Of these, 54 were for industries.

Fungal identification service 712 fungal cultures were received from different academic and other organisations in India for services like morphological and/or molecular identification/ package.

Genetic fidelity testing of tissue culture raised plants 110 samples from 9 production units were tested.

Testing for chapati making properties Green Gold Seeds Pvt. Ltd.

Interactions with corporates

DSM India Pvt. Ltd., Gurgaon; Reliance Industries Ltd., Mumbai; IRS-ONGC, Ahmedabad; KDMIPE, ONGC, Dehradun;Roboniks, Thane; Kanbiosys, Pune;Praj, Pune

Patents applied

Title	Number	Inventors
Polymer coated fluorescent semiconductor nanocrystals	413/MUM/2014	Agrawal S, Paknikar KM, Bodas D
Bacteriophage based microfluidic assay for bacterial detection	414/MUM/2014	Agrawal S, Paknikar KM, Bodas D
Microfluidic biosensor for the detection of pathogens	415/MUM/2014	Agrawal S, Paknikar KM, Bodas D

Title	Number	Inventors
3D porous scaffolds for cell culture and tissue engineering	417/MUM/2014	Kulkarni V, Bodas D, Paknikar KM
Production of cerium sulfide pigment by a novel microbiological process using recombinant strain of *E. coli*	512/MUM/2013	Shete SD, Dhakephalkar PK, Kanekar PP, Ranade DR, Rao JU
A composition with antiglycating property for preventing secondary complications of diabetes	2889/MUM/2013 DBT Ref: BT/ BPFC /04/44/2012-PID	Agte V, Nilegaonkar SS, Gite S, Yadav S.
A method for continuous generation of hydrogen by biodegradation of organic matter using *Clostridium biohydrogenum* MCM B-509 sp nov.	412/MUM/2014	Ranade DR, Kamalaskar L, Lapsiya K, Kshirsagar PR, Dhakephalkar PK
Microbial process for the production of optically pure unnatural carbamoyl amino acids	1384/MUM/2013	Engineer AS, Dhakephalkar PK, Gaikaiwari, RP
Process for enhanced recovery of crude oil from oil-wells at 91°C or higher temperatures using hyperthermophilic indigenous or injected microorganisms / consortia	751/MUM/2014	Dhakephalkar PK, Ranade DR, Bateja S, Biswas SK, Kukreti V, Rana DP

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Zoology

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Barve Apurva, Ghaskadbi Saroj and Ghaskadbi Surendra. 2013b. Structural and sequence similarities of Hydra Xeroderma Pigmentosum A protein to human homolog suggest early evolution and conservation. BioMed Research International, Article ID 854745, 9 pageshttp://dx.doi.org/10.1155 /2013/854745

Lakshmi-Surekha Krishnapati and Ghaskadbi Surendra. 2013. Identification and characterization of *VEGF* and *FGF* from Hydra. International Journal of Developmental Biology,57:877-886

Ratnaparkhi A. 2013. Signaling by Folded gastrulation is modulated by mitochondrial fusion and fission. Journal of Cell Science,126: 5369-76

Monograph

Naik DG, Puntambekar HM, Upadhye AS, Dixit MH, Deshpande AS, Ranade PP. 2014. Quality Standards of Indian Medicinal Plants, ICMR, New Delhi, Volume 12

Book

Datar Mandar, Lakshminarsimhan P. 2013. Flora of Bhagwan Mahavir (Molem) National Park and adjoinings, Goa. Botanical Survey of India. Ministry of Environment and Forest

Book chapters

Ghormade V. 2013. Insect world of RNA interference. In: Biotechnology beyond borders, Eds. Deshpande MV and Ruiz-Herrera J, pp.155-171

Kanekar PP, Sarnaik SS, Dautpure PS, Patil VP, Kanekar SP. 2014. Bioremediation of nitro explosive waste waters. In: Biological Remediation of Explosive Residues, Environmental Science and Engineering, Ed. SN Singh, Springer International Publishing Switzerland, DOI: 10.1007/978-3-319-01083-0_4

Kanekar PP, Kulkarni SO, Nilegaonkar SS, Sarnaik SS, Kshirsagar PR, Ponraj M, Kanekar SP.2014. Environmental Friendly Microbial Polymers, Polyhydroxyalkanoates (Phas) for Packaging and Biomedical Applications. In: Polymers for Packaging Applications, Eds: Sabu Thomas, Nandakumar Kalarikkal, Sajid Alavi, Sandeep KP, Jini Varghese, Srinivasarao Yaragalla, Apple Academic Press, India, ISBN: 9781926895772

Kanekar PP, Sarnaik SS. 2014. Microbial Detoxifying Enzymes Involved in Biodegradation of Organic Chemo pollutants. In:Biotechnology and Bioinformatics: Advances and Applications for Bioenergy, Bioremediation and Biopharmaceutical Research, Eds: Devarajan Thangadurai, Jeyabalan Sangeetha, Apple Academic Press, India, ISBN 9781771880015

Kanekar PP, Joshi AA, Kulkarni SO, Borgave SB, Sarnaik SS, Nilegaonkar SS, Kelkar AS, Thombre RS.2014. Biotechnological Potential of Alkaliphilic Microorganisms. In:Biotechnology and Bioinformatics: Advances and Applications for Bioenergy, Bioremediation and Biopharmaceutical Research. Eds: Devarajan Thangadurai, Jeyabalan Sangeetha Apple Academic Press. India,ISBN 9781771880015

Paknikar KM, Rajwade JM, Soni RN.2013. Therapeutic applications of silver nanoparticles. In: Applications of nanomaterials, Eds. Chaughule RS and Watawe SC, American Scientific Publishers, ISBN:1-58883-181-7, pp. 205-215

Papers presented at Conferences/ Symposia/ Seminars

Microbiology

Kanekar SP, Kelkar AS, Kanekar PP, Dhakephalkar PK. *Haloferax* sp., polyhydroxy butyrate producing haloarchaeon isolated from Andaman Islands, India. 10th International Conference on Halophiles, University of Connecticut, USA, 23-27 June 2013

Internationl Conference on Advances in Biotechnology and Bioinformatics and X Convention Of Biotech Reserch Society,Pune, 25-27 November 2013

Arora P, Ranade DR, Dhakephalkar PK. Development of a microbial process for the recovery of petroleum oil from depleted reservoirs at 91-97°C

Gijare P, Agte V, Nilegaonkar SS. Prebiotic potential of common Indian pulses

Kamalaskar LB, Kshirsagar PR, Lapsiya KL, Dhakephalkar PK, Ranade DR. A laboratory-scale study of bio-hydrogen production from distillery waste using *Clostridium* sp. DMHC-10 in continuous stirred tank reactor

Saxena N, Pore S, Arora P,Kapse N,Engineer A, Ranade DR, Dhakephalkar PK. Diversity and biotechnological potential of bacteria isolated from Indian Oil Reservoirs.

Thombre RS, Kanekar PP, Chitte RR. Production, purification and characterization of cyclodextrin glycosyl transferase enzyme from alkaliphilic *Exiguobacterium aurantiacum* MCMB-102

Kulkarni SO, Kanekar PP, Nilegaonkar SS, Jog JP, Sarnaik SS, Kshirsagar PR. Microbial Technology for production of ecofriendly biodegradable plastic to protect environment from pollution caused by synthetic plastic waste. International Conference on Environmental Conservation by Adopting New Technologies, Modern College, Pune, 28-29 January 2014. (Gold Medal and Certificate)

Botany

Dias L, Kumbhalkar B, Misar A and Upadhye A. Determination of Microbial Load of *Myrica nagi* Thunb. bark for quality control. National Conference on Current Prospects and Challenges in Life Sciences. New Arts, Commerce and Science College, Ahmednagar, 26-27 July 2013

Dhavare PM and More AD. Estimation of secondary metabolites of *Tephrosia purpurea* Pers. National Seminar on Medicinal plants– bioprospecting, agrotechniques and enhancement of secondary metabolites, University of Pune, 13-14 February 2014

Genetics and Plant Breeding

Misra SC, Tamhankar SA, Oak MD, Honrao BK, Cholin S, More MN, Raut AL, Ladhe P, Ayachit G. Improving quality and stem rust resistance in popular Indian durum wheat varieties using marker assisted backcross breeding. International Symposium on Genetics and Breeding of Durum Wheat, Rome, Italy, 27-30 May 2013

Borlaug Global Rust Initiative (BGRI) 2013 Technical Workshop, New Delhi,19–22 August 2013

Katore TD, Parashar R, Chowdhary R,Misra SC, Chatrath R, Sai Prasad SV, Saxena DC, Mamrutha HM, Bagwan JH, Sarah Rich, Anton Wasson, Richard Richards, Greg Rebetzke and Michelle Watt. Root expression of wheat genotypes for their water uptake potential in different agro-climatic conditions.

Patil RM, Honrao BK and Misra SC. Development of durable rust resistance in wheat.

Bipinraj AL, Honrao BK, Misra SC and Tamhankar SA. Identification and mapping of markers linked to leaf rust resistance in Indian durum genotype Malvilocal.

International Conference on Biodiversity, Bioresources and Biotechnology, Mysore, 30-31January 2014

Dangi Rakhee, Tamhankar Shubhada, Rao Suryaprakasa. Assessment of intra- and inter-specific diversity in *Trigonella* using molecular markers

More Manjusha and Tamhankar Shubhada. Chloroplast microsatellite diversity in cultivated grapes and wild *Vitis* species

International Soybean Research Conference, Indore, 22-24 February 2014

Jaybhay SA, Taware SP and Varghese Philips. Optimization of seed rate and row spacing of soybean varieties

Taware SP, Badnikar AA and Upadhye AS. Bio-efficacy evaluation of leaf extracts of some plant species against tobacco caterpillar (*Spodoptera litura* Fab.)

Varghese Philips, Taware SP, Jaybhay SA and Oak Manoj. Oil quality of some elite soybean varieties of India

Chemistry

Waghole RJ and Naik DG. Attractant/repellent formulations for the management of grape mealy bug *Maconellicoccus hirsutus.* BIOCICON 2013, Palayamkotai, 28 November-2 December 2013

Vaidya H, Naik DG. Volatile oil of Indian Propolis: Chemical evaluation and bioactivity study. International Conference on Herbal and Synthetic Drug Discovery, Abeda Inamdar College, Pune,10–12 February 2014 (Poster presentation)

Geology and Palaeontology

Paranjape AR, Kulkarni KG and Kale AS. 2013. Ichnofauna of the Karai Formation, Uttatur Group, Tamil Nadu, India. 9th International Symposium on the Cretaceous System, Ankara, Turkey, 1-5 September 2013

XXXVI Annual Conference of the Indian Botanical Society on Plant Wealth and Human Welfare, DDU GorakhpurUniversity, Gorakhpur, 18-20 October 2013

Bonde SD, Chate SV, Gamre PG and Nipunage DS. *Sabalocarpon indicum* gen. *et* sp.nov.– a palm fruit from the Deccan Intertrappean beds of Silther, District Mandla, Madhya Pradesh

Gamre PG, Bonde SD, Chate SV and Nipunage DS. Anew araceous rhizome *Araceodendron bogneria* gen. *et*sp. nov. from the Nawargaon Intertrappean Beds of Wardha District, Maharashtra

Nipunage DS, Gamre PG, Chate SVand Bonde SD. *Palmoxylon mandlaensis* Lakhanpal *et al.,* a fossil palm wood from the Deccan Intertrappeans of Bhama, District Mandla, Madhya Pradesh'.

24th Indian Colloquium on Micropalaeontology & Stratigraphy, Wadia Institute of Himalayan Geology, Dehradun, 18-21 November 2013

Panchang R and Nigam R. Sponge spicules as palaeo-environmental indicators: a case study from the Ayeyarwady Delta, Burma.

Panchang R, Thakkur B and Parthiban G. Current environmental status of Vashishthi estuary: attributable to climate/ mankind?

Paranjape AR, Kale AS and Kulkarni KG. Trichinopoly Group contact, a sequence stratigraphic perspective

Panchang, R. & Nigam, R. 2013. Multi-proxy approach to decipher high resolution climatic records on the Ayeyarwady Delta Shelf, off Myanmar. Abstract Volume of the International Conference on Recent Developments in Stratigraphy, Fergusson College, Pune, 14-16 December 2013

Gurav SS and Kulkarni KG. 2014. Morphological variations in the ichnogenus *Hillichnus:* a record from the Jaisalmer Formation, Rajasthan, India. 9th International Congress on the Jurassic System, University of Rajasthan, Jaipur, 6-9 January 2014

Zoology

Basargekar Aand RatnaparkhiA. *Drosophila* Mon1 regulates synaptic development at the larval neuromuscular junction.Symposium, NCCS, Pune, 18 May 2013

Annual Meeting of Indian Society of Developmental Biologists, TIFR, Mumbai, 1-4 December 2013

KarandikarA, Kavimandan A, Khade S and Ghaskadbi S. Functional analysis of *Noggin* and *RyK* genes from hydra.(Poster presentation)

Surekha KL and Ghaskadbi S. Identification and characterization of VEGF and FGF from hydra. (Poster presentation)

Surekha KL and Ghaskadbi S. Cross talk between wnt and BMP/Noggin signaling pathways in hydra. XXXVIII All India Cell Biology Conference on Cell Dynamics and CellFate,National Centre for Biological Sciences,Bangalore,22-24 December 2013 (Poster presentation)

Participation in Conferences/ Symposia/ Seminars

Nanobioscience

Chaudhari M - Fluorescence correlation microscopy, IISc and JNCSAR, Bangalore, 24-28 November 2013

Ghormade V- Indo-Mexico conference, Biotechnology beyond borders, NCL, Pune, 7-9 October 2013

Nimisha Singh Baghel NGS-Bioinformatics and data analysis, AU-KBC Research Centre, Anna University, Chennai, 17-21 September 2013

Plant Sciences Division

Botany

Dhavare Pallavi M - National Seminar on Medicinal plants–Bioprospecting, Agrotechniques and Enhancement of Secondary Metabolites, University of Pune, 13-14 February 2014

Dias Lourelle - National Conference on Current Prospects and Challenges in Life Sciences, New Arts, Commerce and Science College, Ahmednagar, 26-27 July 2013

Dias Lourelle, Waghmode Priyanka - Scientific Writing and Publication Ethics, Interdisciplinary School of Health Sciences, University of Pune, Pune, 28 February 2014

Upadhye Anuradha - National workshop on Green Economy in Relation to Rural Development, BAIF Development Research Foundation, Pune, 29-30 January 2014

Genetics and Plant Breeding

Patil RM -Workshop on Breeding Management System, ICRISAT, Hyderabad, 13-15 February 2014

Taware SP, Varghese Philips, Jaybhay SA - 43rd annual group meeting of AICRP Soybean, Jorhat, 1-3 May 2013

Tetali Sujata, Karkamkar SP - 53rd Annual conference of Maharashtra Rajya Draksha Bagayatdar Sangh, Pune, 11-13 August 2013

Tetali Sujata, Karkamkar SP, Phalake SV -Group discussion of All India Coordinated Research Project on Fruits, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, 22-25 January 2014

Animal Sciences Division

Chemistry

Waghole RJ - BIOCICON 2013, Palayamkotai, 28 November - 2 December 2013

Geology and Palaeontology

Kulkarni KG, Gurav SS - 9th International Congress on the Jurassic System, University of Rajasthan, Jaipur, January 2014, 6–9 January 2014

Panchang Rajani - 24th Indian Colloquium for Micropalaeontology & Stratigraphy, Wadia Institute of Himalayan Geology, Dehradun, 18-21 November 2013; International Conference on Recent Developments in Stratigraphy, Fergusson College, Pune, 14-16 December 2013; DST group monitoring workshop, WOS- A project, Anna University, Chennai, 28-29 March 2014

Paranjape Amruta - 9th International Symposium on the Cretaceous System at Ankara, Turkey, 1-5 September 2013; 24th Indian Colloquium for Micropalaeontology & Stratigraphy, Wadia Institute of Himalayan Geology, Dehradun, 18-21November 2013

Zoology

Ghaskadbi S, Patwardhan V, Karandikar A - Annual meeting of Centre of Excellence in Epigenetics, CCMB, Hyderabad, 4-5 June 2013

Ghaskadbi S, Karandikar A, Surekha KL - Annual Meeting of Indian Society of Developmental Biologists, TIFR, Mumbai, 1-4 December 2013

Ghaskadbi S, Ratnaparkhi A, Surekha KL - All India Cell Biology Conference, In Stem, Bangalore, 22-24 December 2013

Ghaskadbi S - Meeting of SERB Task Force on E2OES Scheme, Hyderabad, 29-31 March 2014

Ratnaparkhi A - Mahabaleshwar Seminar: Mitochondria, Metabolism and Energetics, 27–30 January 2014

Degree awards

Candidate	Title	Guide, Co-Guide
PhD		
Annapurna Lilly B	Molecular analysis for leaf rust resistance in bread and durum wheat	Tamhankar SA
Borgave SB	Studies on production of antimicrobial compounds by alkaliphilic bacteria isolated from Lonar Lake	Kanekar PP, Naik DG
More M	Molecular characterization of grape and its wild relatives	Tamhankar SA
Vaidya H	Isolation and application of bioactive natural products from Indian honey bee propolis	Naik DG
MSc PPPR		
Shevte NH	Exomorphic seed studies in commercially important medicinal plants of Maharashtra	Ghate VS

Supervision of postgraduate students

(Guide, Co-Guide, Student, Thesis)

Dhakephalkar P K

Chitrakoti MR. Exploration of bacterial diversity from high temperature oil reservoirs for the degradation of hydrocarbons at elevated temperature

Dahigaokar KV. Archaeal and bacterial diversity of mud volcanoes of Andaman

Engineer AS. Exploration of subsurface microbial flora for the production of valuable enzymes

Kanekar SP. Biodiversity and biotechnological exploration of Halophiles from Andaman Islands and Lonar lake

Shete S: Production of cerium sulfide pigment using *E.coli* expressing recombinant dsr genes

Ghaskadbi SM

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

Ghodke K. Reactive oxygen species and antioxidant enzyme profile during pattern formation

Kulkarni KG

Gurav SS. Significance of bioturbation and bioerosion in the Paleogene of Kachchh, India

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

Naik DG

Deshpande PV. Development of attractant / repellent formulations for Indian honeybees from *Swertia densifolia*

Vaidya HS. Isolation and applications of bioactive natural products from Indian honeybee propolis

Waghole RJ. Exploration of *Tetrastigma sulcatum* for anti-fungal properties

Paknikar KM

Agrawal S. Studies on phage based microfluidic assay for detection of food borne pathogens

Asani S. Mechanistic studies on anti-diabetic action of zinc oxide nanoparticles *in vitro*

Bhagat P. Nuclear delivery of SMAR-I using nanoparticles to modulate cancer

Haghniaz R. Radiofrequency induced hypothermia using dextran coated Lanthanum Strontium Manganese Oxide for tumor regression in mice

Choudhari M. Nanomaterial based rapid testing of antibacterial susceptibility and identification of clinical isolates

Deshmukh S. Studies on catalytically inactivated enzymes as molecular recognition elements and their possible applications

Kulabhusan PK. Phage display peptides for detection of pathogens

Kulkarni V. Studies on magnetic fluid hyperthermia and chemotherapy for treatment of breast cancer

Rajwade JM

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

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

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

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

Ranade DR

Lanjekar VB. Isolation, identification and functional characterization of obligate anaerobic bacteria from human gastro-intestinal tract

Nerlekar M: Diversity of methanogens from oil reservoir in India

Kamlaskar L: Investigation of a novel anaerobic strain MCM B-509 for polyphasic identification and bio-hydrogen production

Singh K: Studies on anaerobic bacteria producing butyric acid and n-butanol from distillery waste

Gophane R: Bioconversion of starch industry waste to n-Butanol

Dabir A: Investigation of biogenic methanogenesis leading to methane hydrate deposits in Krishna Godavari basin

Ratnaparkhi A

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

Upadhye AS

Kumbhalkar BB.Pharmacognostic and molecular studies of some medicinal plants from family Cucurbitaceae.

Member, Nominee – National/ International Committees

Dhakephalkar P K

DBT nominee, Bio-safety Committee, National Environmental Engineering Research Institute, Nagpur

DBT nominee, Bio-safety Committee, APT Research Foundation, Pune

DBT nominee,Bio-safety Committee, KDL Biotech Ltd, Mumbai

Ghaskadbi S

DBT Nominee, Institutional Bio-safety Committees of 1) Lupin limited (Biotech Division), Pune, and 2) InTox, Pune

Nilegaonkar S S

DBT nominee, Institutional Biosafety Committee,Praj Matrix, Pune

Paknikar KM

Member, Task Force, Environmental Biotechnology and Biodiversity Conservation, Department of Biotechnology, Government of India, 2013-2015

Member, Task Force, Aquaculture & Marine Biotechnology, Department of Biotechnology, Government of India, 2013-2015

Member, Programme Advisory Committee, Water Technology Initiative, Department of Science & Technology, Government of India, 2007-onwards

Member, Academic Council, nominated by the Hon'ble Chancellor (Governor of Maharashtra), North Maharashtra University, Jalgaon, 2010-2015

Ranade D R

Member, Advisory Committee, ONGC Energy Centre, New Delhi

Visits Abroad

Paranjape AR.9th International Symposium on the Cretaceous System held at the Middle East Technical University, Ankara, Turkey,1-5 September 2013

Singh SK.International Training Program on Genetic Resources and Intellectual Property Rights, Swedish International Development Cooperation Agency, Uppsala, Sweden, 23 September - 11 October 2013; Follow-up seminar of GRIP International Training Programme on Genetic Resources and Intellectual Property Rights,sponsored by Swedish International Development Cooperation Agency, Sweden and arranged by Swedish University of Agricultural Sciences, Johannesburg,16-19 March 2014

Seminars/ Workshops/ Training Courses Organized

National Technology Day

13 May 2013
Fast track lead generation from natural products
Dr Sunil Kumar Deshmukh
Assistant Director – Natural Products
Piramal Health Care Limited, Mumbai

हिंदी दिवस

12 सितंबर 2013
कार्यालयीन हिंदी
श्री प्रभाकर पांडेय, परियोजना अधिकारी
सी–डैक, पुणे

Vigilance Awareness Programme

29 October - 3 November 2013
Dr SP Taware
Vigilance Officer, ARI administered the pledge to staff members

53rd Prof. SP Agharkar Memorial Oration

18 November 2013
Indian agriculture at the cross road - a way forward
Prof. Mangala Rai
Agriculture Adviser to Chief Minister, Bihar, and
Former Director-General, Indian Council of Agricultural Research, New Delhi

शेतीशास्त्रज्ञ डॉ. आ. भै. जोशी
Shri AP Deshpande

Release of book शेतीशास्त्रज्ञ डॉ. आ. भै. जोशी authored by Shri AP Deshpande, at the hands of Prof. Mangala Rai

Dr BM Khadi
Recipient, Dr RB Ekbote Award

Dr K Gopal
Recipient, Shri VP Gokhale Award

Dr Rinku Umrani
Recipient, Dr PP Kanekar Award

Dr GB Deodikar Memorial Lecture

19 November 2013
The functional characterization of Hyaluronan-binding protein 1 as a molecular switch for cancer progression'
Prof. Kasturi Datta
DBT Distinguished Biotechnology Professor
School of Environmental Sciences
Jawaharlal Nehru University, New Delhi

Shri GB Joshi Memorial Lecture

19 November 2013
Structural understanding of thiol-based redox homeostasis in *Mycobacterium tuberculosis*
Dr. Shekhar C Mande
Director, National Centre for Cell Science, Pune

Golden Jubilee celebrations of the Geology and Palaeontology Group

24 January 2014

Late Cretaceous Dinosaurs in India: Diversity, Habit and Extinction
Dr DM Mohabey, Deputy Director General (Retd.), Geological Survey of India

Past staff and students of the Geology and Palaeontology Group

Republic Day

26 January 2014

The bust of Prof. SP Agharkar, Founder Director, Agharkar Research Institute was installed on 26 January 2014. Dr DR Bapat, Vice-President, MACS garlanded the bust and paid homage to Prof. Agharkar.

National Science Day programme

24 February – 1 March 2014

Talks by Young Scientists, 24-26 February 2014

Karthick Balasubramanian. Diatoms – Microorganism with macroinformation

Ritesh Choudhary. Omega taxonomy vis-à-vis phytodiversity documentation

Monali Rahalkar. Looking at microbial diversity: Cultivation matters!

Virendra Gajbhiye. The use of nanocarriers for drug delivery and targeting

Sachin Jadhav. Isolation, characterization and efficacy of stem cell in different animal disease models

Yogesh Karpe. Replication of Hepatitis-E virus

Rajesh Kumar. Fungal universe for next generation initiative

Ravindra Patil. Development of functional markers for wheat improvement

Sumit Dagar. Anaerobic fungi: Ecology and functional aspects

Bhupendra Shravage. Autophagy in development and disease

Bhoopendra Tiwari. Unusual C-C bond cleaving strategy for asymmetric synthesis

Rinku Umrani. Zinc oxide nanoparticles: new hope for diabetes cure?

27 February 2014

Science as culture: a biologist's view

Prof. Vidyanand Nanjundiah
Centre for Human Genetics
Bengaluru

28 February – 1 March 2014

ARI participated in the science exhibition organized at Giant Metrewave Radio Telescope,Khodad by National Centre for Radio Astrophysics. The following staff and students represented ARI: Dnyanesh Ranade, Biometry & Nutrition; VN Joshi, Botany; Ravindra Waghole, Chemistry; BD Idhol and Parimal Gite, Genetics & Plan Breeding; PG Gamre, Geology & Palaeontology; Pranav Kshirsagar, Microbiology; Shailesh Waghmare, Nanobioscience; Swapnil Savle, Mycology; Mahadev Dawre, Zoology.

Human Resource Development

Two post-graduate students of Petroleum Technology were trained in micropalaeontological techniques at the Geology and Palaeontology Group. Marc Ndimukaga from Rwanda,recipient of Research and Training Fellowship for Developing Country Scientists (RTFDCS) was trained at the Chemistry Group. Archana Naik, Assistant Professor, Department of Botany, University of Pune was trained in antifungal screening of plant crude extract, handling of fungal cultures and their long term maintenance at the Mycology and Pathology Group.

Maharashtra Association for the Cultivation of Science

Certificate course in Home Gardening

20 June - 26 December 2013

Valedictory function, January 2014
Dr KMPaknikar, Dr Sujata Bhargav, Dr KBanerjee

Certificate course in Field Botany in collaboration with Nisargasevak

28 February - 9 May 2014

Group of participants; Field visit to empress garden

Institutional Research Projects

Project Code	Project Title	Investigator(s)	Associated staff and students
	Microbial Sciences Division		
	Microbiology		
MIC-10	Microbial diversity and conservation	Ranade DR, Paknikar KM, Dhakephalkar PK, Chitte RR	Kelkar AS, Kapase N
MIC-24	Pharmacological aspects of fibrinolytic enzyme actinokinase from thermophilic *Streptomyces* sp.	Chitte RR	-----
MIC-26	Biological hydrogen production	Ranade DR	Lapsiya KL, Kamalaskar LB
MIC-28	Isolation and characterization of obligate anaerobic bacteria from human gastrointestinal tract	Ranade DR	Lanjekar VB
MIC-30	Exploration of thermophiles for industrially important biomolecules and enzymes	Ranade DR, Dhakephalkar PK	Pore S
	Nanobioscience		
MIC-20	Application of nanobiotechnology to improve agriculture, human health and environment	Paknikar KM, Rajwade JM, Ghormade V, Bodas DS	Umrani R, Kulkarni V, Agrawal S, Bhagat P, Asani S, Kulabhusan P, Deshmukh Kelkar S, Haghniaz R, Kumbhar J, Deshpande P, Dapkekar A, Chikte R
NBS-1	Bacterial molecular recognition elements (MRE) - tagged magnetic nanoparticles as a tool for rapid antibiotic susceptibility testing	Rajwade JM, Paknikar KM	Choudhari M
NBS-2	Genome-wide transcriptional profiling of response of biofilm bacteria to antimicrobial nanoparticles and designing strategies for control of biofilms	Rajwade JM, Paknikar KM	Singh N
NBS-3	RNAi for insect control	Ghormade V, Paknikar KM	Marathe I
NBS-4	Miniature disposable PCR	Bodas DS, Paknikar KM	Kamat V

Project Code	Project Title	Investigator(s)	Associated staff and students
NBS-5	Nanomaterials Treatment to Seeds for Enhancing Germination Efficiency in Medicinal Trees	Rajwade JM, Upadhye AS, Paknikar KM	Kshirsagar P
Plant Sciences Division			
Botany			
BOT-15	Digitizing AHMA	Datar MN	Gaikwad N Nadgir P
BOT-17	Repository of Crude drugs, Authentication service and Development of HPTLC profile library of PRS (Phytochemical Reference Standard)	Upadhye AS	Rajopadhye A DiasL
BOT-18	Plant community studies on selected grasslands of Maharashtra.	Datar MN	Gorade P
BOT-20	Evaluation of antioxidant potential from plant resources: Fruit and vegetable juices	Upadhye AS	Misar A
Genetics and Plant Breeding			
GEN 04	Tagging of some important disease resistance and quality traits in wheat	Tamhankar SA, Misra SC, Oak MD	Gole C, Sneha Devi
GEN 12	In vitro techniques for conservation and multiplication of economically important plants and crop plants	Misra SC, Mukherjee P	Bachute S
GEN 14	Marker assisted selection for seedlessness in table grape breeding	Tetali S Tamhankar SA	Chintapalli N
GEN 15	Characterization of GA-sensitive dwarf durums at molecular level	Patil RM	Vikhe P
Mycology and Plant Pathology			
MYC-01	Studies of lichenized fungi including culture *in vitro* and bioactive metabolites	Behera BC Sharma BO	Gaikwad SB Pol CS, Khare R
MYC-02	Fungal identification service and culture collection	Singh SK Singh PN	Sadaf A
MYC-03	Studies on forest fungi	Singh SK Singh PN	Sutar SA Gaikwad SB

Project Code	Project Title	Investigator(s)	Associated staff and students
Animal Sciences Division			
Biometry and Nutrition			
New BIO-1	Role of maternal dietary calcium in relation to non-communicable diseases (NCDs) risks in adult offspring	Joshi BN Kulkarni PP	Sarode JS, Apte PP, Sharma S
New BIO-2	Hepcidin-a Possible Indicator for assessing iron status	Kulkarni PP Joshi BN	Apte PP, Ghatpande N
New BIO-4	Functional foods for Diabetes: Evaluation of oral hypoglycemic proteins from *Costus speciosus* (Koenig), Insulin plant Pushkarmula) from Western Ghats of India	Joshi BN	Hardikar M
Chemistry			
CHM 1	Study of Pheromones & Semiochemicals	Naik DG	Dandge CN Puntambekar HM Deshpande PV
CHM 3	Chemical investigations of medicinal plants	Naik DG Upadhye AS Srivastava P	Waghole RJ Bharmal RB Jakhade AP
CHM 7	Chemical examination of honeybee propolis & study of its applications	Naik DG Puntambekar HM	Vaidya HS
CHM 9	Environment-friendly synthesis of biomolecules	Srivastava P WagholeRJ	–
Geology and Palaeontology			
GEO 17	Role of ichnofauna in deciphering sequence of deposition of the Upper Jurassic rocks of the Marwar Basin (April 2013 – March 2018)	Kulkarni KG	Gurav S
GEO 18	Study of biogenic sedimentary structures in The Kundalika estuary, West Coast of Maharashtra and their comparison with fossil Counterparts (April 2013–March 2016)	Kulkarni KG Panchang R	Biniwale S

Project Code	Project Title	Investigator(s)	Associated staff and students
Zoology			
ZOO14	*In- Vivo* binding assay as a tool to study neuronal development	Ratnaparkhi A	
ZOO 15	Structural and functional characterization of pattern-forming and DNA repair genes from hydra	Ghaskadbi S Patwardhan V	Kavimandan A Surekha KL
ZOO 16	Signaling pathways in glial cell development: the role of FGFR signaling	Ratnaparkhi A	

Inter-Institutional Collaborative Projects

Project	Collaboration with	Investigators
Isolation, Purification and Characterization of Environment Friendly Plant and Marine Invertebrates Based Bioactive compounds for Antifouling Applications	Naval Material Research Laboratory, Ambarnath	Naik DG, ARI Susan Titus, NMRL
Study of pheromones and semiochemicals	Central Bee Research and Training Institute, Pune	Naik DG, ARI Wakode MT, CBRTI
Study of semio-chemicals for mealy bug control	National Research Centre for Grapes	Naik DG, ARI Banerji K, NRC-G

Sponsored Projects

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Grant Received (₹) 6
1	ARI/SP/001	All India Co-ordinated Research Project on Soybean (1.4.1968 onwards)	ICAR, New Delhi	S.P. Taware	4735000.00
2	ARI/SP/002	All India Co-ordinated Fruit Improvement Project (1.10.70 onwards)	ICAR, New Delhi	S.C. Misra	3132000.00
3	ARI/SP/003	All India Co-ordinated Wheat Improvement Project (1.4.1972 onwards)	ICAR, New Delhi	S.C. Misra	10108500.00
4	ARI/SP/033	Production of Soybean Breeder Seeds of Annual Oil Seed Crops (2.2.88 onwards)	ICAR, New Delhi	S.P. Taware	-
5	ARI/SP/034	Front-line Demonstrations of Annual Oil Seed Soybean (21.2.89 onwards)	ICAR, New Delhi	S.P. Taware	20000.00
6	ARI/SP/043	Front-line Demonstrations in Wheat (1.4.1993 onwards)	ICAR, New Delhi	S.C. Misra	-
7	ARI/SP/118	Collaborative Multilocational evaluation for Bread wheat germplasm by NBPGR (March-2006 onwards)	ICAR, Karnal	S.C. Misra B.K. Honrao	-
8	ARI/SP/152	WOS-B Scheme on behalf of S & S Division (7.9.2007 to 30.04.2013)	DST, New Delhi	D.G. Naik	-
9	ARI/SP/160	National facility for culture collection of fungi (3.3.2008 to 2.3.2013)	DST, New Delhi	S.K. Singh	-
10	ARI/SP/166	Generating new wheat germplasm with enhanced drought/heat tolerance using AB genomes genetic diversity (15.10.2008 to 31.10.2013)	World Bank	S.C. Misra	-
11	ARI/SP/168	Digitized Inventory of medicinal plant resources of Maharashtra (16.2.08 to 31.03.2013)	RGST Commission	A.S. Upadhye	-
12	ARI/SP/170	Accredited Test laboratory (ATL) under the national certification system for Tissue culture raised plants (12.2.2009 to 28.8.2013)	DBT, New Delhi	S.A. Tamhankar	229000.00
13	ARI/SP/179	Mobilizing Qtl/Genes for quality Traits into high yielding WHEAT varieties Through Marker- Assisted Selection (23.09.2009 to 22.09.2014)	DBT, New Delhi	S.A. Tamhankar	1230000.00
14	ARI/SP/180	Marker Assisted selection for development of kunitz TRYPSIN inhibitor free SOYBEAN varieties (29.9.2009 to 28.9.2014)	DBT, New Delhi	Philips Verghese Manoj Oak	310000.00
15	ARI/SP/181	Molecular marker assisted development of biotic stress resistant wheat varieties (13.11.2009 to 12.11.2014)	DBT, New Delhi	S.A. Tamhankar	855000.00
16	ARI/SP/182	Network -Project- Drought Tolerance in WHEAT- Phenotyping for adaptive mechanisms to facilitate MAS based wheat breeding (23.11.2009 to 31.03.2013)	ICAR, Karnal	S.C. Misra	-
17	ARI/SP/183	Network -Project- physiological WATER use efficiency (root Trains) (23.11.09 to 31.03.2014)	ICAR, Karnal	S.C. Misra	75211.00
18	ARI/SP/185	Recovery of Ret Species of Ceropegia from Western Ghats (10.01.2010 to 09.01.2015)	DBT, New Delhi	A.S. Upadhye	366500.00

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Grant Received (₹) 6
19	ARI/SP/186	Importance of reactive OXYGEN species in early chick embryonic development (7.04.2010 to 6.4.2013)	Dept. of Atomic Energy (DAE) Mumbai	S.M. Ghaskadbi Vidya Patwardhan	-
20	ARI/SP/188	Epigenetics of Regeneric in Hydra (19.03.2010 to 18.03.2015)	DBT, New Delhi	S.M. Ghaskadbi	-
21	ARI/SP/189	Transgenic Hydra Facility for the Study of Molecular Regulation of Regeneric and Pattern Formation (19.03.2010 to 18.03.2015)	DBT, New Delhi	S.M. Ghaskadbi	-
22	ARI/SP/190	Folded Gastrulation -An insight into Mechanisms regulating glial morphogenesis and axonal ensheathment in Drosophila (26.03.2010 to 25.03.2013)	DBT, New Delhi Ratnaparkhi	Anuradha	-
23	ARI/SP/191	Role of Copper in Alzheimer's Disease : An interaction of copper with AB peptide (2.8.2010 to 1.8.2013)	DST, New Delhi	Prasad Kulkarni	350000.00
24	ARI/SP/192	Feasibility of Biohydrogen and Biomethane producing from Sago Industry Effluent using mixed microbial consortia in 2 stage fixed bed Anaerobic Reactors (22.7.2010 to 21.7.2013)	DBT, New Delhi	D.R. Ranade	-
25	ARI/SP/194	The role of SG2NA in tissue differentiation during chick embryonic development (17.1.2011 to 16.1.2014)	DST	S.M. Ghaskadbi	250000.00
26	ARI/SP/196	Resistant starch enriched Probiotic supplement for inflammatory bowel disorders (15.3.2011 to 14.3.2014)	DBT	S.S. Nilegaonkar	-
27	ARI/SP/197	RNAI based genetic screen to identify interactors of VAPB and their in VAPB mediated ALS (9.3.2011 to 8.3.2014)	DBT	Anuradha Ratnaparkhi	497000.00
28	ARI/SP/198	Molecular breeding and selection strategies to combine and validate Qtl's for improving WVE and heat tolerance in Wheat (New GCP) (31.12.2011 onwards)	New GCP	S.C. Misra	466277.00
29	ARI/SP/199	Development of two stage Anaerobic bacterial process for butanol production from Industrial Wastes (2.6.2011 to 1.6.2014)	DBT	D.R. Ranade	-
30	ARI/SP/201	Women Scientist Scheme A (WOS-A) entitled "Documentation of mangrove foraminifera of coastal Maharashtra with special reference to their environmental significance" (21.12.2011 to 20.12.2014)	DST	Rajani Panchang	-
31	ARI/SP/202	"Molecular systematics, phylogeny and ecology of Ceropegia L.(apocynaceae - asclepiadondeae) in India" (29.6.2012 to 28.6.2015)	DST, SERB	Sachin Punekar	400000.00
32	ARI/SP/203	Molecular Investigation and Cultivation of Microbial Diversity Associated with Methane Hydrates with Special Emphasis on Energetics of Methanogenesis. (12.1.2012 to 12.2.2015)	ONGC	D.R. Ranade P.K. Dhakephalkar	-
33	ARI/SP/204	Process for biomethane production from marine algae (7.3.2012 to 22.4.2013)	Reliance	D.R. Ranade	278880.00

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Grant Received (₹) 6
34	ARI/SP/205	IRSONGC - Water Treatment (21.3.2012 to 21.3.2014) Extended upto 15.07.2014	ONGC	P.K. Dhakephalkar	-
35	ARI/SP/206	Biofertication of wheat for micronutrients through conventional and molecular approaches-Phase II (22.03.2012 to 21.03.2017)	DBT	S.A. Tamhankar	-
36	ARI/SP/207	National Network program on lichens: Bioprospecting its secondary compounds and establishing cultures and collections (21.03.2012 to 20.03.2017)	DBT	B.C. Behra	-
37	ARI/SP/208	Production of lichen secondary metabolities using bioreactor and study of their cytotoxic activity in vitro (05.03.2012 to 04.03.2015)	SERB	Niraj Verma	200000.00
38	ARI/SP/209	Inventorization of the Flora and Fauna from Selected Sacred Groves of Pune District (23.04.2012 to 22.04.2013)	Forest	A.S. Upadhye	-
39	ARI/SP/210	Copper induced oxidative stress and neurotoxicity of AB peptides in cellular model of Alzheimer's Disease (09.5.2012 to 8.05.2015)	DBT	Prasad Kulkarni	-
40	ARI/SP/211	Enhancing use efficiency of micronutrients: Novel delivery systems (20.06.2012 to 19.06.2017)	ICAR	K.M. Paknikar	379009.00
41	ARI/SP/212	Bioactive Molecules for the Treatment of the Alzheimer's Disease (03.09.2012 to 03.09.2015)	DBT	A.M. Bapat P. Kulkarni	-
42	ARI/SP/213	Developing rapid diagnostics for the detection of Aspergillosis (03.10.2012 to 2.10.2015)	DBT	K.M. Paknikar	660000.00
43	ARI/SP/214	Isolation, Purification and Characterization of Environment Friendly Plant and Marine Invertebrates Based Bioactive compounds for Antifouling Applications (28.8.2012 to 28.02.2015)	NMRL	D.G. Naik	1000000.00
44	ARI/SP/215	Chitosan based hydrogel nanoparticles for applications in wound healing (3.10.2012 to 02.10.2015)	DBT	Kavita Pal	-
45	ARI/SP/216	Survey of Wild Edible Plants and Wild Relatives of Edible Plants Found in Western Ghats of Maharashtra (28.01.2013 to 27.01.2015)	Forest	Mandar Datar	-
46	ARI/SP/217	Research Training Fellowship for Developing Country Scientists (RTF-DCS) (27.03.2013 to 26.09.2013)	NAM Centre	Marc Ndimukaga	-
47	ARI/SP/218	Exploitation of inter-specific biodiversity for Wheat Improvement (01.03.2013 to 28.02.2018)	DBT	S.C. Misra	-
48	ARI/SP/219	KanBiosys (09.04.2013 to 08.04.2016)	KanBiosys Ltd	K.M. Paknikar	833332.00
49	ARI/SP/220	Ecological studies of lichens in the Deccan outcrops (14.06.2013 to 13.06.2016)	SERB	Gargee S. Pandit	1150000.00

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Grant Received (₹) 6
50	ARI/SP/221	Microbial regulation of immune gene expression in hydra (14.06.2013 to 13.06.2016)	SERB	S.M. Ghaskadbi	1500000.00
51	ARI/SP/222	Molecular mapping of GA-sensitive dwarfing genes and crop establishment traits in durum wheat (25.06.2013 to 24.06.2016)	SERB	R.M. Patil	1000000.00
52	ARI/SP/223	Increasing the productivity of the wheat crop under conditions of rising temperatures and water scarcity in South Asia (01.07.2012 to 30.06.2015)	BMZ	S.C. Misra	882700.00
53	ARI/SP/224	Microbial control of methane turnover in rice fields (05.08.2013 to 04.08.2016)	DBT	Monali Rahalkar	2473732.00
54	ARI/SP/225	Biomethane of Rice Straw (30.12.2013 to 29.06.2014)	DSM	P.K. Dhakephalkar	1960000.00
55		KanBiosys Ltd- Soyabean	KanBiosys Ltd	S.P. Taware	160000.00
56		Late quaternary vegetation and climate changes in southwest India evidence from sediment archives of kollam Alappuzha coastal plains of the south kerala sedimentary basin	CSIR	K.P.N. Kumaran	447793.00
		TOTAL			**3,59,49,934.00**

Personnel (as of 31.03.2014)

Director (Officiating)
Dr. K.M. Paknikar, Scientist G

Animal Sciences Division

Dr. S.M. Ghaskadbi, Sc.G & HOD

Biometry & Nutrition Group

Dr.(Mrs.) B.N. Joshi, Sc.D
Dr. P.P. Kulkarni, Sc.D
Mrs. J.S. Sarode, Lab Asst. C
Dr. (Mrs). P.P. Apte, Lab Asst. A

Chemistry Group

Dr. D.G. Naik, Sc.F, In-Charge
Dr. Bhoopendra Tiwari, Sc.D
Dr. (Mrs.) P. Srivastava, Sc.C
Dr. (Mrs.) C.N. Dandge, Tech. Officer B
Dr. (Mrs.) H.M. Puntambekar, Tech. Officer B
Shri R.J. Waghole, Technical Asst. A
Ms. R.B. Bharmal, Tech. Asst. A

Geology & Palaeontology Group

Dr. (Mrs.) K.G. Kulkarni, Sc.C
Dr. P.G.Gamre, Tech. Asst. B
Shri S.S. Deshmukh, Lab. Asst. D
Shri N.S. Mane, Attendant B

Zoology Group

Dr. S.M. Ghaskadbi, Sc.G, In-Charge, Zoology & SEM Facility
Dr. (Ms) V.G. Patwardhan, Sc.E
Dr. (Mrs.) A. Ratnaparkhi, Sc.D
Dr. S.H. Jadhav, Sc.C
Dr. C. Patra, Sc. C
Dr. B.V. Shravage, Sc. C
Shri M.B. Daware, Tech. Officer A
Shri V.B. Sindol, Tech. Asst. B
Mrs. R.J. Londhe, Tech. Asst. B
Shri K.V. Tiwari, Attendant A, Animal House
Shri V.M. Gosavi, Attendant A, Animal House

Microbial Sciences Division

Dr. D.R. Ranade, Sc. G & HOD

Microbiology Group

Dr. D.R. Ranade, Sc. G, In -Charge
Dr. P.K. Dhakephalkar, Sc.F
Dr. (Mrs) S.S. Nilegaonkar, Sc.E
Dr. R.R. Chitte, Sc.C
Dr. (Mrs.) M.C. Rahalkar, Sc.C
Dr. S.S. Dagar, Sc.C
Shri. P.R. Kshirsagar, Sc.B
Dr. (Mrs.) D.C. Kshirsagar, Tech. Officer B
Mrs. A.S. Kelkar, Tech. Officer A
Shri. V.K. Nalavade, Lab Asst .D
Shri. V.B. Lanjekar, Lab Asst. B
Shri G.M. Ingale, Attendant B
Shri S.M. More, Attendant B

Nanobioscience Centre

Dr. K.M. Paknikar, Sc.G, In-Charge
Dr. (Mrs.) JM Rajwade, Sc.D
Dr. D.S. Bodas, Sc.C
Dr. (Smt.) Vandana Ghormade, Sc. C
Dr. (Mrs.) R.D. Umrani, Sc. C
Dr. Virendra Gajbhiye, Sc.C
Dr. Yogesh Karpe, Scientist C
Shri SS Waghmare, Lab Asst. B

Virology

Mrs. R.G. Bambe, Tech. Asst. A

Plant Sciences Division

Dr. S.C. Misra, Sc.F, In-Charge

Botany Group

Dr. (Smt.) S.A. Tamhankar, Sc. F & In-Charge
Dr. (Mrs.) A.S. Upadhye, Sc. C
Dr. Ritesh Kumar Choudhary, Sc. C
Dr. Karthick B, Sc. C
Dr. M.N. Datar, Sc. B

Smt. K.K. Patil, Tech. Officer A
Shri V.N. Joshi, Tech. Asst. B
Dr. (Mrs.) A.V. Misar, Tech. Asst. A
Shri M.H. Mhetre, Lab Asst. C
Mrs. N.S. Gaikwad, Lab Asst. B
Shri L.M. Kale, Lab Asst. B
Shri M.D. Chavan, Attendant D
Shri S.N. Gajbhar, Attendant C

Genetics & Plant Breeding Group

Dr. S.C. Misra, Sc.F, In-Charge
Dr. S.P. Taware, Sc.F
Dr. (Smt.) S.A. Tamhankar, Sc.F
Dr. B.K. Honrao, Sc.E
Dr. Mrs. S.P. Tetali, Sc.C
Dr. M.D. Oak, Sc.C
Dr. P. Varghese, Sc.C
Dr. R.M. Patil, Sc. C
Shri S.A. Jaybhay, Sc. B
Shri V.M. Khade, Tech. Officer A
Mrs. S.P. Karkamkar, Tech. Officer A
Mrs. A.A. Deshpande, Tech. Asst. A
Shri M.T. Gurav, Attendant. C
Shri S.V. Ghadge, Attendant A

Hol farm

Shri A.M. Chavan, Tech. Officer A, In-Charge
Shri V.D. Surve, Tech. Officer A
Shri J.H. Bagwan, Tech. Asst. B
Shri B.D. Idhol, Tech. Asst. B
Shri S.V. Phalke, Tech. Asst. B
Shri V.D. Gite, Tech. Asst. B
Shri B.N. Pulje, Tech. Asst. A
Shri. D.H. Salunkhe, Lab Asst. B
Shri D.N. Bankar, Lab Asst. B
Shri P.G. Lavand, Lab Asst. A
Shri A.D. Sonvalkar, Driver
Shri S.S. Khomane, Attendant. D
Shri T.A. Kolte, Attendant C
Shri R.D. Shinde, Attendant C
Shri S.L. Bhandalkar, Attendant A
Shri S.R. Kachhi, Attendant A
Shri D.L. Kolte, Attendant A

Mycology & Plant Pathology Group

Dr. S.K. Singh, Sc.E
Dr B.C. Behera, Sc.E
Dr. P.N. Singh, Sc.C
Dr. Rajesh Kumar K.C., Sc. C
Dr. A. Baghela, Sc. C
Shri B.R. Kakade, Tech. Officer A
Dr. (Mrs.) B.O. Sharma, Tech. Officer A
Shri S.B.Gaikwad, Tech. Asst. B
Shri K.D. Gole, Lab. Asst. B

Administration Unit

Shri G Barik, Administrative Officer
Shri P.S Pujari, Officer B
Mrs. V.V. Dunakhe, Officer A
Shri T.N. Pardeshi, Tech. Officer A
Mrs JV Deshpande, Pvt. Secretary
Shri V.B. Bhalerao, Officer A
Shri D.S. Zade, Assistant B
Shri CD Nagpure, Asst. B
Mrs M.B. Tiwari, Asst. B
Mrs. M.V. Patake, Asst. A
Mrs. P.D. Gagare, Asst. A
Shri S.A. Shaikh, Asst. A
Shri R.M. Salunke, Attendant B
Shri B.B Gavali, Driver
Shri R.M. Dhandhore, Attendant B
Shri K.R. Sathe, Attendant A

Accounts Unit

Sqn Ldr S Francis (Retd.), Finance & Accounts Officer
Shri S.K. Walambe, Officer B
Shri H.N. Mate, Officer B
Mrs. P.P. Pathak, Officer A
Mrs. S.A. Bibikar, Officer A
Shri S.V. Kulkarni, Asst. B
Ms. T.V. Kurhade, Asst. A
Mr. A.V. Wable, Asst. A
Ms. S.R. Jagtap, Asst. A

Purchase Unit

Shri P.V. Gosavi, Officer C/ Stores & Purchase Officer
Shri A.G. Dhongade, Sr. PS
Mrs. S.A. Tembe, Officer A
Mrs. U.S. Kulkarni, Asst. B
Mr. R.B. Dhobale, Asst. A
Shri A.T. Salvi, Attendant B

Store Unit

Shri P.C Bora, Officer B & In-Charge
Mrs. V.G. Tallu, Officer A
Mrs. S.S. Kalekar, Asst. A
Ms. D.V. Gavade, Asst. A
Mr. S.S. Chavan, Asst. A

Director's Office

Shri A.D. Joshi, Asst. B
Mrs. R.S. Shinde, Asst. A
Shri S.P. Balsane, Attendant A

Instrumentation Unit

Shri A.V. Chaudhari, Tech. Officer C
Ms. Manisha Kharade, Tech. Officer B
Shri B.N. Shinde, Technician D
Shri S.B. Karanjekar, Attendant. D

Library

Dr. S.N. Kulkarni, Pr. Lib. & Info. Officer
Shri R.P. Janrao, Asst. Lib. & Info. Officer
Shri A.D. Patil, Asst. B
Shri R.R. Deshpande, LAA/Technician A
Shri R.R. Kale, Attendant A

Other Technical Staff

Shri R.K. Dongre, Tech. Officer D
Dr. G.K. Wagh, Tech. Officer D
Shri B.A. Kawthekar, Technician D
Shri A.S. Waghole, Technician D

Promotions

Scientific Staff

Dr. P.K. Dhakephalkar, Sc. F
Dr. S.C. Misra, Sc. F
Dr. S.A. Tamhankar, Sc. F
Dr. S.P. Taware, Sc. F
Dr. S.K. Singh, Sc. E
Dr. B.C. Behera, Sc. E
Dr. S.S. Nilegaonkar, Sc. E
Dr. B.K. Honrao, Sc. E
Dr. Mrs. J.M. Rajwade, Sc. D
Dr. P.P. Kulkarni, Sc. D
Dr. M.D. Oak, Sc. C
Dr. P.N. Singh, Sc. C
Dr. A.S. Upadhye, Sc. C
Dr. P. Srivastava, Sc. C
Dr. P. Varghese, Sc. C

Technical

Dr. B.O. Sharma, Tech. Officer A

Library Cadre

Shri R.P. Janrao, Asst. LIO

Driver & NTMS

Shri M.D. Chavan, Attd. D
Shri T.A. Kolte, Attendant C

FINANCIAL UPGRADATION UNDER MACP SCHEME

Shri S.K. Walambe, Officer B
Shri A.D. Sonvalkar, Driver Gr. I
Shri R.M. Dhandore, Attd. B
Shri G.M. Ingale, Attd. B
Shri N.S. Mane, Attd. B
Shri A.T. Salvi, Attd. B
Shri R.R. Deshpande, Lab. Asst. A/ Tech. A
Shri R.R. Kale, Attd. A
Shri S.R. Kachhi, Attd. A
Shri K.R. Sathe, Attd. A
Shri S.V. Ghadge, Attd. A
Shri K.V. Tiwari, Attd. A

Appointments

Name & Designation	Group/Unit	Date of Appointment
Scientific		
Dr. R.D. Umrani, Sc. C	CNB	23.09.2013
Dr. M.C. Rahalkar, Sc. C	MSD	24.09.2013
Dr. R.M. Patil. Sc. C	Genetics	15.10.2013
Dr. S.S. Dagar, Sc. C	MSD	11.11.2013
Dr. R.K. Chaudhary	Botany	25.11.2013
Dr. S.H. Jadhav, Sc. C	Zoology	26.11.2013
Dr. Karthick B., Sc. C	Botany	11.12.2013
Dr. Virendra Gajbhiye, Sc. C	CNB	13.12.2013
Dr. BhoopendraTiwari, Sc. D	Chemistry	16.12.2013
Dr. Y.A. Karpe, Sc. C	CNB	01.01.2014
Dr. B. Shravage, Sc. C	Zoology	03.01.2014
Dr. Rajesh Kumar K.C., Sc. C	Mycology	27.01.2014
Dr. A. Baghela, Sc. C	Mycology	25.02.2014
Dr. C. Patra, Sc. C	Zoology	28.02.2014
Technical		
Mr. V.D. Gite, Tech. Asst. B	Hol Farm	26.09.2013
Mr. D.K. Maurya, LAC	Mycology	06.02.2014
Ms. S.S. Lad, LAC	Mycology	12.02.2014
Administrative		
Mr. S.S. Chavan, Asst. A	Stores	07.02.2014
Mrs. P.D. Gagare, Asst. A	Admin.	07.02.2014
Ms. S.R. Jagtap, Asst. A	Accounts	07.02.2014
Mr. A.V. Wable, Asst. A	Accounts	11.02.2014
Mr. R.B. Dhobale, Asst. A	Purchase	12.02.2014
Mr. S.A. Shaikh, Asst. A	Admin.	20.02.2014
Mrs. R.S. Shinde, Asst. A	Dir. Office	03.03.2014

Superannuation

Dr. Mrs. M.K. Gokhale, Sc. D	31.05.2013
Shri L.S. Chavan, Attendant D	31.05.2013

Reservation & Concessions

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

Details of posts filled during 2013-2014

Group	SC	ST	OBC	General	Total
A	1	–	4	8	13
B	–	–	1	–	1
C	–	1	3	5	9
Total	1	1	8	13	23

*includes one PH person belonging to Minority community

RESEARCH ASSOCIATES

ARI PROJECTS

1. Dr. (Ms.) Anagha Rajopadhye
2. Dr. (Ms.) Prachi Kshirsagar
3. Dr. (Ms.) K.L Surekha
4. Dr. Kaushal Lapsiya

SPONSORED PROJECT

1. Dr. (Ms.) Shikha Sharma
2. Dr. (Ms.) Aditi Karandikar
3. Dr. (Ms.) Sarita Gund

SENIOR RESEARCH FELLOWS

ARI PROJECTS

1. Ms. Shraddha Deshmukh
2. Ms. Roshani Khare

SPONSORED PROJECT

1. Dr. (Ms.) Harshada D. Kannur
2. Mr. Ajit Raut
3. Ms. Shruti Sawantdesai
4. Mr. Amol Mali

JUNIOR RESEARCH FELLOWS

ARI PROJECTS

1. Mr. Milind Choudhari
2. Ms. Nimisha Singh

SPONSORED PROJECT

1. Mr. Dnyanesh Ranade
2. Ms. Shailaja Agrawal
3. Ms. Samiksha Khade
4. Ms. Varsha Honkalas

RESEARCH STUDENTS

ARI PROJECTS

1. Ms. Sona S. Sharma
2. Mr. Niraj Ghatpande
3. Ms. Manasi Hardikar
4. Ms. Pratibha Katti (Nadgir)
5. Ms. Laurelle Dias
6. Mr. Purushottam Gorade
7. Mr. Ninad Puranik
8. Mr. Shreyas Pradhan
9. Ms. Shweta Gurav
10. Mr. Siddharth Biniwale
11. Mr. Somnath Sutar
12. Ms. Gauri Pawale
13. Ms. Chaitrali Pol
14. Ms. Sadaf Aamir
15. Ms. Charuta Patwardhan (Gole)
16. Mr. Parimal Vikhe

SPONSORED PROJECT

1. Mr. Gulshan Walke
2. Ms. Priyanka Waghmode
3. Ms. Rohini Jadhav
4. Mr. Bapi Mandal
5. Mr. Swapnil Savale
6. Ms. Anuradha Bhandare
7. Ms. Girija Ayachit
8. Ms. Amruta Alwaris
9. Ms. Padmaja Shete
10. Ms. Amruta Gaykar
11. Ms. Radha Patki
12. Ms. Anjali Pundkar
13. Ms. Chaitrali Jadhav
14. Ms. Anagha Basargekar
15. Mr. Suyog Ubhe
16. Ms. Sukhada Sangekar

17 Ms. Neerajkshi Chittapalli
18 Ms. Richa Rajani
19 Ms. Aditi Kavimandan
20 Mr. Soham Pore
21 Ms. Ashwini Dabir
22 Ms. Neha Saxena
23 Ms. Jai Panse

17 Ms. Pradnya Nagkirti
18 Ms. Rekha Gophne
19 Ms. Kajal Singh
20 Ms. Priyanka Gijare
21 Ms. Neelam Kapse
22 Mr. Prafull Shinde
23 Ms. Sonal Diwanay
24 Ms. Pranitha Pandit
25 Ms. Prachi Pathare

FELLOWS WITH OWN FELLOWSHIP

1 Dr. Neeraj Verma, DST-SERB, Young Sci.
2 Dr. (Ms.) Gargee Pandit, DST-SERB, Young Sci.
3 Dr. K.P.N. Kumaran, CSIR, Emeritus Scientist
4 Dr. (Ms.) Rajani Panchang, PI, WOS-A Project
5 Dr. (Ms.) Ruta Limaye, CSIR-RA
6 Ms. Pankuri Kawdiwale, DST-INSPIRE
7 Ms. Yamini Ginotra , CSIR- SRF
8 Ms. Bhagyashri Kumbhalkar, CSIR-SRF
9 Ms. Vaishnavi Kulkarni, CSIR- SRF
10 Mr. Paresh Deshpande, CSIR- SRF
11 Ms. Amruta Paranjape, CSIR-SRF
12 Mr. Prasad Bhagat, CSIR- SRF
13 Ms. Leena Kamalaskar, CSIR-SRF

14 Mr. Ashwin Dapkekar, UGC- SRF
15 Ms. Shefali Ramteke, UGC - SRF
16 Ms. Kumari Shweta, UGC- SRF
17 Ms. Alisha Galande, UGC-SRF
18 Ms. Jyoti Kumbhar, CSIR-JRF
19 Ms. Swati Asani, CSIR-JRF
20 Ms. Preeti Arora, CSIR -JRF
21 Mr. Vivek Kamat, UGC -JRF
22 Ms. Komal Raval, UGC-JRF
23 Ms. Rohini Chikte, UGC-JRF
24 Ms. Sneha Maheshwari, UGC- JRF
25 Mr. Prabir Kulbhusan, ICMR-JRF
26 Mr. Nishikant Dixit, ICMR-JRF

TEMPORARY STAFF UNDER SPONSORED PROJECTS

Ms. Pallavi Dhavare (Randive) - Project Trainee II
Mr. Alok Jakhade - Technical Assistant
Ms. Sneha Ramesh Devi- Technical Assistant

राजभाषा का दर्जा 2013-14

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

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

Auditor's Report
2013 - 14

Maharashtra Association for the Cultivation of Science

AUDITOR'S REPORT

We have audited the attached Balance sheet of Maharashtra Association for the Cultivation of Science, Pune as at 31st March, 2014 and the Income and Expenditure Account for the year ended on that date, annexed there to.

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

Subject to above, we report that:

1) We have obtained all the information and explanations, which to the best of ourknowledge and belief were necessary for the purpose of our Audit.

2) In our opinion, proper books of accounts as required by law have been kept by the institute so far as it appears from our examination of those books.

3) The Balance Sheet and Income and Expenditure Account dealt with by the report are in agreement with the books of accounts.

4) In our opinion and to the best of our information and according to the explanations given to us, subject to our comments in annexure to this report, the said accounts give a true and fair view.

   (i) In the case of the Balance Sheet, of the state of affairs of the Centre as at 31st March 2014

   (ii) In the case of the Income and Expenditure Account, of the Surplus for the year ended on the date.

For **MARATHE PADHYE & ATHALYE**

Chartered Accountants

Sd/-

Milind S. Padhye

Partner

Place: Pune

Date: 21th August, 2014

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

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

For year ending : **31st March, 2014**

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

Place: Pune
Date: 21th August, 2014

For **MARATHE PADHYE & ATHALYE**
Chartered Accountants

Sd/-

Milind S. Padhye
Partner

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

Balance Sheet as on 31.03.2014

Amount - Rs.

FUNDS AND LIABILITIES	SCH.	AMOUNT	PROPERTY AND ASSETS	SCH.	AMOUNT
CAPITAL ACCOUNTS	A	10,761,721	FIXED ASSETS	C	9,354,355
OTHER LIABILITIES	B	14,740	Investments	D	12,664,634
INCOME & EXP.A/C (Sub Schedule 4)		12,764,252	Deposits & Advances	E	1,040,846
			Cash & Bank Balances	F	480,878
TOTAL		**23,540,713**	**TOTAL**		**23,540,713**

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 MARATHE PADHYE & ATHALYE,
Chartered Accountants

Sd/-
Partner

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

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

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

21th August, 2014

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

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH 2014

Amount - Rs.

EXPENDITURE	AMOUNT	INCOME	AMOUNT
Depreciation : Immovable Properties	2,965	Interest (Realised)	
(By way of provision or adjustment)		on S.B. A/c	22,881
		On Investments	1,240,314
Establishment Expenses	136,985		
(As per Schedule H)		Donation in Cash	20,000
Capital Expenditure	100,090	Income tax refund F.Y. 2011-12	380,590
Audit fees	3,371	Income from other Sources	78,846
		(As per Schedule L)	
Legal Fees	69,400		
		Interest on income tax refund	19,030
Professional fees	18,150		
Depreciation : Furniture & Dead Stock	13,904		
Expenditure on the object of The Trust	184,520		
(As per Schedule K)			
Surplus Carried over to Balance Sheet	1,232,277		
TOTAL	**1,761,661**	**TOTAL**	**1,761,661**

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 MARATHE PADHYE & ATHALYE,

Chartered Accountants

Sd/-

Partner

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

21th August, 2014

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

STATEMENT OF RECEIPTS & PAYENTS FOR THE YEAR ENDED ON 31.3.2014

Amount - Rs.

RECEIPTS	SCH.	AMOUNT	PAYMENTS	SCH.	AMOUNT
Opening Balances	F	111,902	Establishment Expenses	H	128,701
Income Tax refund F.Y. 2011-12		380,590	Expenditure on Object of Trust	K	184,520
Interest Received On Savings Bank A/c		22,881	Audit Fees		3,371
			Legal Fees		69,400
Interest on Income Tax refund		19,030			
			Professional fees		18,150
Life Membership Fees		1,500			
Interest on Investments		1,642,939	Fixed Deposit with Banks		6,960,000
Income from Other Sources	G	78,846	Indirect Receipt & Payment	J	128,798,390
Encashment of FDR with Bank		5,776,852	Capital Expenditure		100,090
Indirect Receipt & Payment	J	128,688,960	Closing Balances	F	480,878
Donation Recceived for Dr. R.B. Ekbote Award		20,000			
TOTAL		**136,743,500**	**TOTAL**		**136,743,500**

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 MARATHE PADHYE & ATHALYE,
Chartered Accountants
Sd/-
Partner

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

21th August, 2014

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SCHEDULE "A" CAPITAL ACCOUNT

Amount - Rs.

PARTICULARS	SUB-SCH	AMOUNT
TRUST FUND OR CORPUS	1	10,377,874
OTHER EARMARKED FUNDS	2	383,847
TOTAL(RS.)		**10,761,721**

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SCHEDULE "B" CURRENT LIABILITIES

Amount - Rs.

PARTICULARS	SUB-SCH	AMOUNT
OTHER LIABILITIES	3	14,740
TOTAL(RS.)		**14,740**

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SCHEDULE "C" FIXED ASSETS

Amount - Rs.

PARTICULARS	SUB-SCH	AMOUNT
IMMOVABLE PROPERTIES	5	9,147,232
FURNITURE AND DEAD STOCK	6	207,123
TOTAL(RS.)		**9,354,355**

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SCHEDULE "D" : INVESTMENTS

Amount - Rs.

Sr. No.	Name of the Company	Particulars		Date of Investment	Date of maturity	Total Rs.
A.	SHARES					1,325
1	Central Potteries Ltd.	Share of Rs. 25 each			Not quoted	
	Nagpur					
	Certificate No.1343 bearing Sr.No.29114 to 29126		13 ordinary	21.01.1949		
	Certificate No. 551 bearing Sr.No. 3717 to 3756		40 ordinary	10.06.1940		
2	HINDUSTAN MOTORS LTD.	Share certificate No.33932	50 ordinary			500
		Shares of Rs. 10/- each				
		4632651-4632700				
3	BANK OF MAHARASHTRA	6008467793		30.12.2011	30.12.2014	300,000
		60088467534		30.12.2011	30.12.2014	300,000
		60126451909		01.03.2013	01.03.2014	200,000
		60152059714		08.11.2013	08.11.2015	1,660,000
		60150708401		24.10.2013	23.10.2015	800,000
		60161620207		08.02.2014	06.02.2016	400,000
		6137302238		09.07.2013	0.5.07.2015	1,300,000
		60137302953		09.07.2013	0.5.07.2015	2,800,000
4	INDIAN BANK	741859		09.03.2012	07.03.2015	500,000
		741860		09.03.2012	07.03.2015	500,000
		9225971		09.08.2012	06.08.2015	200,000
		168893		24.11.2012	24.11.2014	1,000,000
		168892		24.11.2012	24.11.2014	500,000
		168891		24.11.2012	24.11.2014	1,000,000
5	BANK OF BARODA	249183		02.03.2012	02.03.2014	71,219
6	BANK OF INDIA	7246		24.11.2012	24.11.2014	1,131,590
7	**GRAND TOTAL**					**12,664,634**

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SCHEDULE "E" DEPOSITS & ADVANCES

Amount - Rs.

PARTICULARS	AMOUNT	AMOUNT
DEPOSITS : (As per last Balance Sheet)		
Telephone Deposit	15,000	
Deposit with Court	15,000	30,000
ADVANCES :		
Income Tax Deducted at Source	35,907	35,907
(As per last Balance Sheet)		3,510
	-	92,948
	-	
Interest accrued on Investments		
(Subject to confirmation from bank & other agencies)		
As per last Balance Sheet)	1,415,219	
Less Realised during the year	735,746	679,473
Accured Interest during the year		199,008
TOTAL Rs.		**1,040,846**

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SCHEDULE "F" CASH & BANK BALANCES

Amount - Rs.

PARTICULARS	OPENING BALANCE	CLOSING BALANCE
Cash in Hand	286	6468
BANK :-		
With Bank of Maharashtra Erandwana Branch in Savings A/c No.9709	75004	381257
With State Bank of India Deccan Gymkhana Branch in S.B. A/c No. 01100005452	31170	33072
With Union Bank of India, F.C.Road Branch in S.B.A/c 48941261091951	5442	60081
TOTAL (RS.)	**111,902**	**480,878**

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

Schedules to and forming part of Stateemnt of Receipts & Payments and
Income & Expenditure account for the year ended on 31.3.2014

SCHEDULE"G" : INCOME FROM OTHER SOURCES

Amount - Rs.

PARTICULARS	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT
Sale of Publication	-	1,346
Fee for Home Gardening Course	-	77,500
TOTAL (RS.)	**-**	**78,846**

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

SCHEDULE "H" : ESTABLISHMENT EXPENSES

Amount - Rs.

PARTICULARS	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT
Contribution to welfare fund	5,000	-
Honorarium to Staff	81,190	81,190
Meeting Expenses	23,066	23,066
Miscellaneous Expenses (includes Advt.Expenses)	6,204	6,200
Postage Expenses	6,670	3,390
Travelling & Conveyance	7,392	7,392
Printing & Stationery	7,463	7,463
TOTAL (RS.)	**136,985**	**128,701**

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

SUB SCHEDULE "I" EXPENDITURE ON THE OBJECT OF THE TRUST

Amount - Rs.

PARTICULARS	AMOUNT
Expenditure out of Earmerked Donations	
Prof. V.P Gokhale Award Expenses	9,744
Dr. R.B.Ekbote Award Expenses	7,400
Dr. P.P. Kanekar Award Expenses	5,625
Donation Expenses Prof. P.V.Sukhatme	750
Prof.S.P.Agharkar Chair Expenses	60,000
Home Garden Course Expenses	35,140
Prof. S.P. Agharkar Memorial Day expenses	41,903
Seminar Exps. Geology	23,958
TOTAL (RS.)	**184,520**

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

Schedules to and forming part of Statement of Receipts & Payments and Income & Expenditure Account for the year ended on 31.3.2014

SCHEDULE "J" : INDIRECT RECEIPTS & PAYMENTS

Amount - Rs.

PARTICULARS	RECEIPT	PAYMENT
ARI Account	120,690,000	120,793,232
Schemes Account	7,915,000	7,915,000
Advance to staff	77,500	77,500
TDS Professional fees & Contractor	6,460	4,277
ARI Staff TDS Payable		8,381
TOTAL	**128,688,960**	**128,798,390**

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

SCHEDULE "K" : EXPENDITURE ON THE OBJECT OF THE TRUST

Amount - Rs.

PARTICULARS	AMOUNT
Expenditure out of Earmerked Donations	
Prof. V.P Gokhale Award Expenses	9,744
Dr. R.B.Ekbote Award Expenses	7,400
Dr. P.P. Kanekar Award Expenses	5,625
Donation Expenses Prof. P.V.Sukhatme	750
Prof.S.P.Agharkar Chair Expenses	60,000
Home Garden Course Expenses	35,140
Prof. S.P. Agharkar Memorial Day expenses	41,903
Seminar Exps. Geology	23,958
TOTAL (RS.)	**184,520**

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

SCHEDULE "L" : INCOME FROM OTHER SOURCES

Amount - Rs.

PARTICULARS	AMOUNT
Sale of Publication	1,346
Fee for Home Gardening Course	77,500
TOTAL (RS.)	**78,846**

As per our report of even date

For **MARATHE PADHYE & ATHALYE,**

Chartered Accountants

Sd/-

Partner

Sd/- Sd/- Sd/-

HON.F.&A.O. **HON.TREASURER** **HON.SECRETARY**

M.A.C.S. M.A.C.S. M.A.C.S

21th August, 2014

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SUB SCHEDULE "1" TRUST FUND OR CORPUS

Amount - Rs.

PARTICULARS	AMOUNT
As per Last Balance Sheet	10,276,284
Add Life Member ship Fees	1,500
Add: Capital Account Construction of Statue & Books	100,090
TOTAL(RS.)	**10,377,874**

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

SUB SCHEDULE "2" OTHER EARMARKED FUNDS

Amount - Rs.

PARTICULARS	AMOUNT
Reserve Fund (Created vide resolution No. 16 dated 12.4.1984) (As per Last Balance Sheet)	36,926
Museum Fund (As per Last Balance Sheet)	888
Prof. S.P. Agharkar Fund (As per Last Balance Sheet)	14,000
Prof. S.P. Agharkar Birth Centenary Fund (As per last Balance Sheet)	332,033
TOTAL (RS.)	**383,847**

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

SUB SCHEDULE "3" OTHER LIABILITIES

Amount - Rs.

PARTICULARS	AMOUNT
Advance payable to Mr B.K. Kale (As per Last Balance Sheet)	886
ARI Account	8,280
TDS Contractor payable	2,203
Audit fees payable	3,371
TOTAL (RS.)	**14,740**

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

SUB SCHEDULE "4" INCOME & EXPENDITURE ACCOUNT

Amount - Rs.

PARTICULARS	AMOUNT	AMOUNT
Opening Balance	11,531,975	
Add: Surplus during the year as per Income & Expenditure Account	1,232,277	
		12,764,252
TOTAL (RS.)		**12,764,252**

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SUB SCHEDULE "5" : IMMOVABLE PROPERTIES

Amount - Rs.

	Particulars	Rate of Depreciation	GROSS BLOCk			DEPRECIATION BLOCK					WDV
			Cost as on 1.4.13	Additions during the year	Total Cost as on 31.3.2014	Upto 31.3.2013	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	Total as on 31.3.2014	as on 31.3.2014
1	Land at Pune		96,500	-	96,500	-	-	-	-	-	96,500
2	Land at Songaon		8,819,437		8,819,437		-	-	-	-	8,819,437
3	Biometry Building	2.50%	115,200	-	115,200	84,350	2,880	-	2,880	87,230	27,970
						-	-	-	-		
4	Microbiology Building	2.50%	3,389	-	3,389	2,562	85	-	85	2,647	742
	(Refer Note A)						-	-	-		
							-	-	-		
5	Land Development		202,583	-	202,583	-	-	-	-	-	202,583
	Expenses at Hol						-	-	-		
							-	-	-	-	
	TOTAL (RS.)		**9,237,109**	**-**	**9,237,109**	**86,912**	**2,965**	**-**	**2,965**	**89,877**	**9,147,232**

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

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

Schedules to and forming part of Balance sheet as on 31.3.2014

SUB SCHEDULE "6" FURNITURE AND DEAD STOCK

Amount - Rs.

Particulars		GROSS BLOCk			DEPRECIATION BLOCK						
		Cost as on 1.4.2013	Additions during the year	Total cost as on 31.3.2014	Rate of Depre-ciation	Up to 31.3.2013	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	Total as on 31.3.2014	WDV as on 31.3.2014
1		2	3	4	5	6	7	8	9	10	11
A)	**(I) GENERAL**										
1.	Office Equipments & Furniture & Sports Items	392,943	-	392,943	10%	389,096	-	-	-	389,096	3,847
2.	Apparatus & Equipments	247,036		247,036	20%	213,209	1	-	1	213,210	33,826
3.	Electric Fittings	9,870	-	9,870	10%	9,869	-	-	-	9,869	1
4.	Books	117,522	2,000	119,522	20%	116,037	1	400	401	116,438	3,084
5.	YType System for Grapes-Hol	110,497	-	110,497	10%	33,150	11,050	-	11,049.70	44,200	66,298
6.	Construction of Statute	-	98,090	98,090	3%	-	-	2,452	2,452	2,452	95,638
	SUB TOTAL (A)(I)	**877,868**	**100,090**	**977,958**		**761,361**	**11,052**	**2,852**	**13,904**	**775,265**	**202,694**
A)	**(II) SPECIAL PUBLICATIONS**										
1.	Marathi Publication by Prof. M.N.Kamat (Cost of Rs. 1.54)	4,428		4,428	0	2,367		-		2,367	2,061
2.	Enumeration of Plants from Gomantak by Dr.V.D.Vartak (Cost of Rs. 3.60)	3,154		3,154	0	1,100		-		1,100	2,054
	SUB-TOTAL (A)(II)	**7,582**	**0**	**7,582**		**3,467**		**-**		**3,467**	**4,115**
	TOTAL A (I+II)	**885,450**	**100,090**	**985,540**		**764,828**	**11,052**	**2,852**	**13,904**	**778,732**	**206,809**
B)	**UNIVERSITY OF PUNE**										
1.	Office Equipment & Furniture	1,300		1,300	-	1,242		-		1,242	58
2.	Books	25,538		25,538	-	25,341		-		25,341	197
3.	Aparatus & Equipments	9,914		9,914	-	9,891		-		9,891	23
	TOTAL (B)	**36,752**	**0**	**36,752**		**36,474**		**-**		**36,474**	**278**
C)	**GOVT.OF MAHARASHTRA**										
1.	Office Equipment & Furniture	1,008		1,008	10%	993				993	15
2.	Apparatus & Equipments	21,363		21,363	20%	21,345				21,345	18
3.	Books	1,210		1,210	20%	1,209				1,209	1
	TOTAL (C)	**23,581**	**0**	**23,581**		**23,547**		**-**		**23,547**	**34**
	GRAND TOTAL (A+B+C)	**945,783**	**100,090**	**1,045,873**	**-**	**824,849**	**11,052**	**2,852**	**13,904**	**838,753**	**207,123**

Agharkar Research Institute of Maharashtra Association for the Cultivation of Science

Agharkar Research Institute of Maharashtra Association for the Cultivation of Science, Pune
Aided By Department of Science and Technology, Government of India, New Delhi

AUDITOR'S REPORT

We have audited the attached Balance Sheet of Agharkar Research Institute of Maharashtra Association for the Cultivation of Science, situated at GC Agharkar Road, Pune as at 31st March, 2014 and Income and Expenditure Account for the year ended on that date annexed there to.

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

Closing stock as on 31st March, 2014 has been included in the financial statements as valued and certified by the management of the Institute. Valuation has not been verified by us and reliance has been placed on the value of closing stock certified by the management.

Subject to above, we report that:

1) We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our Audit.

2) In our opinion, proper books of accounts as required by law have been kept by the institute so far as it appears from our examination of those books.

3) The Balance Sheet, Income and Expenditure Account and the Receipts and Payments Account dealt with by the report are in agreement with the books of accounts.

4) In our opinion and to the best of our information and according to the explanations given to us, subject to our comments in annexure to this report, the said accounts give a true and fair view.

(i) In the case of the Balance Sheet, of the state of affairs of the Centre as at 31st March 2014
(ii) In the case of the Income and Expenditure Account, of the deficit for the year ended on the date.

5) In our opinion, the Balance sheet & Income & Expenditure Account dealt with by this report, are in compliance with the accounting standards prescribed by the Institute of Chartered Accountants of India except the Accounting Standards – 1 "Disclosure of Accounting Policies", Accounting Standards – 2 "Valuation of Inventories", Accounting Standards – 5 – "Net Profit or Loss for the Period, Prior Period items and changes in Accounting Policies", Accounting Standards – 11 – "The effects of changes in Foreign Exchange Rate", Accounting Standards – 12 – Accounting for Government Grants". Exceptions can be referred to Significant Accounting Policies & Notes to Account followed by the Institute and impact of the same on Financial Statement cannot be quantified.

For **MARATHE PADHYE & ATHALYE**

Chartered Accountants

Sd/-

Milind S. Padhye

Partner

Place: Pune

Date: 21th August, 2014

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Balance Sheet as on 31.03.2014

Amount - Rs.

Particulars	Schedule	Current Year	Previous Year
CORPUS/CAPITAL FUND AND LIABILITIES:			
CORPUS/CAPITAL FUND	1	26,476,774	46,860,968
RESERVES AND SURPLUS	2	-	-
EARMARKED/ENDOWMENT FUNDS	3	48,809,530	39,258,104
SECURED LOANS AND BORROWINGS	4	-	-
UNSECURED LOANS AND BORROWINGS	5	-	-
DEFERRED CREDIT LIABILITIES	6	-	-
CURRENT LIABILITIES AND PROVISIONS	7	122,614,139	169,222,423
TOTAL		**197,900,443**	**255,341,495**
ASSETS:			
FIXED ASSETS	8	88,403,346	87,153,936
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	49,635,730	101,776,425
INVESTMENTS-OTHERS	10	-	-
CURRENT ASSETS,LOANS,ADVANCES ETC. MISCELLANEOUS EXPENDITURES (to the extent not written off or adjusted)	11	59,861,367	66,411,134
TOTAL		**197,900,443**	**255,341,495**
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 MARATHE PADHYE & ATHALYE,
Chartered Accountants

Sd/-
Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

21rd August, 2014

M.A.C.S's Agharkar Research Institute, Pune - 414 004

Income and Expenditure Account for The Year Ended 31.03.2014

Amount - Rs.

Particulars	Schedule	Current Year	Previous Year
Income			
Income from Sales/Services	12	647,744	1,112,783
Grants/Subsidies	13	171,834,012	137,236,208
Fees/Subscriptions	14	191,189	82,213
Income from Investments(Income on Invest. From earmarked/endowment Funds transferred to Funds)	15	-	-
Income from Royalty, Publications etc.	16	70,170	57,605
Interest Earned	17	5,665,607	7,314,339
Other Income	18	1,037,520	305,140
Increase/(decrease) in stock of Laboratory consumables	19	(8,885)	66,860
Donation Received in kind (Equipment)		-	
Total (A)		**179,437,357**	**146,175,148**
Expenditure			
Establishment Expenses	20	107,928,920	91,071,800
Other Administrative Expenses etc.	21	39,451,442	37,674,231
Expenditure on Grants, Subsidies etc.	22	-	-
Interest	23	-	-
Depreciation (Net Total at the year-end- corresponding to schedule 8)	8	52,441,189	4,297,367 -
Total (B)		**199,821,551**	**133,043,398**
Balance being excess of Income over Expenditure (A-B)		(20,384,194)	13,131,750
Transfer to Trust fund (for capital expenditure Schedule D)		64,552,030	39,321,239
BALANCE BEING SURPLUS/(DEFICIT)CARRIED TO		64,552,030	39,321,239
CORPUS/CAPITAL FUND		**(84,936,224)**	**(26,189,489)**
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 **MARATHE PADHYE & ATHALYE,**

Chartered Accountants

Sd/-

Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

21th August, 2014

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 1 : Corpus/Capital Fund

Amount - Rs.

Particulars	Current Year		Previous Year	
Balance as the beginning of the year	46,860,968		33,729,218	
Add : Contributions towards Corpus/Capital Fund (Schedule D)	64,552,030		39,321,239	
Add/ (Deduct) : Balance of Net Income/ (Expenditure)	(84,936,224)		(26,189,489)	
		26,476,774		46,860,968
Balance at the end of the year		**26,476,774**		**46,860,968**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 2 : Reserves & Surplus

Amount - Rs.

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

M.A.C.S's Agharkar Research Institute, Pune - 411 004

Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 3 : Earmarked/Endowment Funds

Amount - Rs.

Particulars	Fund-wise Break Up				Totals	
	Tech.Dev. Fund	Dr. A. B. Joshi	Dr. A. D. Agate	Welfare fund	Current Year	Previous Year
a) Opening balance of the funds	38,538,458	584,823	4,535	130,288	39,258,104	33,374,691
b) Additions to the funds:				-		
i) Donations/grants					-	
ii) Income from investments made on account of funds.	1,912,993	17,817	175		1,930,985	3,067,181
iii) Culture Identification Charges	3,517,534				3,517,534	
iv) Overhead Charges from Scheme	3,047,252				3,047,252	2,819,968
v) Interest received on Funds from various projects	628,235				628,235	
vi) Refund from scheme for fellowship advance made						314,850
vii) Other Misc. Income	404,607			334	404,941	
viii) Contribution from MACS				5,000	5,000	
ix) Unspent Balance of HCJMRI Project	27,524				27,524	
TOTAL (a+b)	**48,076,603**	**602,640**	**4,710**	**135,622**	**48,819,575**	**39,576,690**
c) Utilisation/Expenditure towards objectives of funds						
I) Capital Expenditure						
Fixed Assets						
Others						
Advance paid to ARI						
II) Revenue Expenditure						
Salaries,Wages and allowances etc.						
Rent						
Other Administrative Expense		5,965	500	3,580	10,045	3,736
(Payment to CSIR, ICMR fellows- Temp. Advance						314,850
TOTAL (C)	**-**	**5,965**	**500**	**3,580**	**10,045**	**318,586**
NET BALANCE AS AT THE YEAR-END (a+b-c)	**48,076,603**	**596,675**	**4,210**	**132,042**	**48,809,530**	**39,258,104**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

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		**0.00**		**0.00**

Note: Amounts due within one year Nil

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

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		**0.00**		**0.00**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 6 : Deferred Credit Liabilities

Amount - Rs.

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

Note: Amounts due within one year

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 7 : Current Liabilities & Provisions

Amount - Rs.

Particulars	Current Year		Previous Year	
A. Current Liabilities :-				
1. Acceptances	-		-	
2. Sundry Creditors:				
a) For Goods		102,627		509,645
3. Advances Received			-	
4. Interest Accrued but not due on:				
a) Secured Loans/borrowings			-	
b) Unsecured Loans/borrowings			-	-
5. Sundry Liabilities:				
a) Sales Tax			-	
b) Culture Identification charges			2,667,244	
c) Unpaid Salary	737,464		546,171	
d) Income Tax (Contractor)	57,838		16,367	
e) Income tax for (Hired Labour charges)	115			
f) Service Tax Payable			636	
g) Group Insurance	67,636		65,829	
h) LIC	71,371		70,657	
i) PF Commissioner A/c	392,469		610,840	
j) P.F.New Pension Scheme	401,737		277,199	
k) State Profession Tax	29,000		24,100	
l) Income tax (salary)	676,587	2,434,217	671,389	4,950,432
6. Other current Liabilities(Various Consultancies)	620,810		651,354	
Self Contribution - P.F.				651,354
7. Unspent Balance of Grant	464,350		51,608,362	
8. Earnest Money Deposit for Construction and Equipments	3,074,590		1,856,254	
9. Security deposit	1,150,416		1,163,996	
10. Other Tution Fees	46,819		34,002	
11. Recovery of Bank Loan	20,635		21,365	
12. DST PAC Meeting	163,610		163,610	
13. FIST Programme	546,809		546,809	
14.DST Straigernt Meeting	58,406		58,406	
15 DST Solar Meeting	128,254		128,254	
16. HCJMRI Project (Unspent Balance)			27,524	
17. Doodhpapeshwar Ltd. Project			18,031	
18. Organizing Group Meeting &Monitoring Committee	540		540	
19. DST Good Lab Practice Seminar	51,860		51,860	
20. Scheme	1,912,217		9,003,065	
21. Retention Money	152,967		152,967	
22. Organising Meeting of Task Force			400,000	
23. Technology Transfer - Robonik India Pvt. Ltd.	1,400,000	9,792,283	1,000,000	66,235,045
Total (A)		**12,329,127**		**72,346,476**

Particulars	Current Year		Previous Year	
B. PROVISIONS				
1. For Taxation				-
2. Gratuity	60,800,257		54,860,953	
3. Superannuation/Pension			-	-
4. Accumulated Leave Encashment	41,853,996		35,819,329	
5. Trade Warranties/Claims				-
6. Others				
- Salary payable for March	5,606,223		3,946,439	
- Audit fees	16,854		16,854	
- Seminar Expenses				
- Electricity & Power	578,470		436,850	
- Postage & Telephone	18,905		34,922	
- Vehicle maintainance	11,762			
- Campus maintainance	324,893		114,532	
- Legal Fees				
- Travelling expenses				
- Security Service Charges	123,488		82,814	
- Honararium				
- Water Charges	121,262		165,528	
- Database Expenses				
- Information & Technology Services			50,000	
- Medical Expenses			61,659	
- Advertisement			3,503	
- Subscription to Journals			13,100	
- Purchases			31,018	
- Science Day Expenses				
- Reimbursement of Tuition fee			88,567	
- Liveries				
- Farm Expenses	599			
- Hired Labour Charges	332,229		467,077	
- Service Contract (Repairs & Maintenance)			26,423	
- Deposit Linkied Insurance Fund			2,600	
- Leave Travel Concession				
- Reimbursement of Medical Expenses of Retired Staff Members			34,679	
- P.F. & N.P.S.	452,021		521,465	
- P.F. & N.P.S. Adm. Charges	44,053		47,832	
- Stipend			11,000	
- Reimbursement of Telephone Expenses			11,758	
- Provision for Books			18,664	96,867,566
- ARI Staff TDS Refundable				8,381
Total (B)		**110,285,012**		**96,875,947**
Total (A+B)		**122,614,139**	**-**	**169,222,423**

M.A.C.S's Agharkar Research Institute, Pune - 411 004

Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 8 : Fixed Assets

Amount - Rs.

Description	Gross Block						Depreciation					Net Block	
	Cost/valuation As at beginning of the year	Rate of Dep.	Additions during the year	Deletions during the year	Net cost as on 31.3.2014	Cost valuation at the year-end	As at the beginning of the year	Depreciation on the opening cost	Dep. on Additions during the year	Total dep. duing the year	Total up to the Year-end	As at the Current year-end	As at the Previous year-end
A. FIXED ASSETS:													
1. LAND													
a) Freehold	174,914	Nil	-		-	174,914	-				-	174,914	174,914
b) Leasehold	-	Nil	-		-	-	-				-	-	
2. BUILDINGS:					-	-							
a) On Freehold	64,139,622	2.5%	212,131		212,131	64,351,753	12,509,544	1,603,491	5,303	1,608,794	14,118,338	50,233,415	51,630,078
b) On Leasehold	-	Nil			-	-	-	-	-	-	-	-	
c) Ownership Flats/Premises	-				-	-	-	-	-	-	-	-	
d) Superstructures on Land and not beloging to the entity	-	Nil			-	-	-	-	-	-	-	-	
e) Temporary Structures	1,941,457	2.5%			-	1,941,457	530,072	48,536	-	48,536	578,608	1,362,849	1,411,385
f) Shed and glasshouse at Hol	628	2.'5%			-	628	627	-	-	-	627	1	1
3. PLANT MACHINERY & EQUIPMENT	-				-	-		-	-	-			
a) Equipment at Hol	54,578	10%	121,317		121,317	175,895	54,578	5,458	12,132	17,590	72,168	103,728	-
b) Equipments at Pune	198,026,175	20%	45,169,811		45,169,811	243,195,986	184,566,656	39,605,235	9,033,962	48,639,197	233,205,853	9,990,133	13,459,519
4. VEHICLES	1,791,407	20%			-	1,791,407	1,791,407	-	-	-	1,791,407	-	1
5. FURNITURE, FIXTURES	13,044,821	10%	293,292		293,292	13,338,113	12,734,132	1	29,329	29,330	12,763,462	574,651	310,689
MODULAR FURNITURE-NEW LAB	8,239,764	10%			-	8,239,764	823,977	823,976	-	823,976	1,647,953	6,591,811	7,415,787
6. COMPUTER/PERIPHERALS	10,607,663	20%	893,780		893,780	11,501,443	9,783,802	1	178,756	178,757	9,962,559	1,538,884	823,861
7. ELECTRIC INSTALLATIONS	2,983,737	10%			-	2,983,737	2,776,699	1	-	1	2,776,700	207,037	207,038
8. TRANSFORMER / DIESEL GENERATOR	1,491,549	15%	2,266,739		2,266,739	3,758,288	1,491,549	223,732	340,011	563,743	2,055,292	1,702,996	-
9. LIBRARY BOOKS	6,860,755	20%	449,176		449,176	7,309,931	6,056,554	1	89,835	89,836	6,146,390	1,163,541	804,201
10. TUBEWELLS & W. SUPPLY	112,538	2.5%			-	112,538	69,870	2,813	-	2,813	72,683	39,855	42,668
11. SOLAR SYSTEM HOSTEL	167,379	10%			-	167,379	109,975	16,738	-	16,738	126,713	40,666	57,404
12. OTHER FIXED ASSETS	5,399,852	2.5%	772,318		772,318	6,172,170	1,355,673	134,996	19,308	154,304	1,509,977	4,662,193	4,044,179
13. RE-CARPATING OF EXISTING ROADS	1,862,736	2.50%	1,150,054		1,150,054	3,012,790	46,568	46,568	28,751	75,320	121,888	2,890,902	1,816,168
14. RENOVATION CANTEEN		2.50%	1,329,408		1,329,408	1,329,408	-	-	33,235	33,235	33,235	1,296,173	-
15. CC TV WOKS AT ARI CAMPUS		15%	517,114		517,114	517,114	-	-	12,928	12,928	12,928	504,186	-
16. CONSTRUCTION OF TEMPERORY SHED AT SONGAON		2.50%	515,458		515,458	515,458	-	-	12,886	12,886	12,886	502,572	-
17. CONST. OF H.T. SUBSTATION	5,328,142	2.5%			-	5,328,142	372,096	133,204	-	133,204	505,300	4,822,842	4,956,046
TOTAL OF CURRENT YEAR	**322,227,717**		**53,690,598**	**-**		**375,918,315**	**235,073,779**	**42,644,752**	**9,796,437**	**52,441,189**	**287,514,968**	**88,403,346**	**87,153,939**
PREVIOUS YEAR	**306,221,456**		**16,015,363**	**9,102**		**322,227,717**	**230,776,414**	**1,884,718**	**2,412,649**	**4,297,367**	**235,073,781**	**87,153,936**	**51,122,649**
TOTAL	**322,227,717**		**53,690,598**	**-**	**-**	**375,918,315**	**235,073,779**	**42,644,752**	**9,796,437**	**52,441,189**	**287,514,968**	**88,403,346**	**87,153,939**

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

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

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

Amount - Rs.

Particulars	Current Year	Previous Year
1. In Government Securities	-	-
2. Other approved Securities(Templeton Mutual Fund)	-	-
3. Shares	-	-
4. F.D.R. with Indian Bank (Dr. A.B. Joshi Donation)	250,000	250,000
5. Subsidiaries and Joint Ventures		
6. Others (Fixed Deposits) (Dr. A.D. Agate Donation)	5,001	5,001
7. Others (Fixed Deposits from Technology Development Fund A/c:SBI & UBI)	49,380,729	40,246,584
8. Others(Fixed Deposit with Union Bank of India) (includes accrued interest)	-	61,274,840
TOTAL	**49,635,730**	**101,776,425**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 10 : Investments - Others

Amount - Rs.

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

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2014

Schedule 11 : Current Assets, Loans & Advances

Amount - Rs.

Particulars	Current Year		Previous Year	
A. CURRENT ASSETS:				
1. Inventories:				
a) Stores and Spares				
b) Publications	21,527		23,919	
c) Stock-in-trade of consumables (as taken valued and certified by the Management)	144,507	166,034	151,000	174,919
2. Sundry Debtors:	2,325		2,325	
a) Debts Outstanding for a period exceeding six months				
b) DBT Monitoring Meeting	48,156		48,156	
-Receivable from staff (Animal house Tender form)	3,140		3,140	
c) Brain storming Session	166,602		166,602	
3. Cash balances in hand (including cheques/drafts and imprest)	12,365	232,588	5,929	226,152

Particulars	Current Year		Previous Year	
4. Bank Balances:				
a) With scheduled Banks				
- On Current Accounts	4,024,615		10,249,375	
- On Deposit Accounts(CLTD A/c)				
- On Savings Accounts	11,791,990		10,275,619	
- On Savings Accounts(TDF)	31,854	15,848,459		20,524,994
b) With non-Scheduled Banks:				
- On Current Accounts				
- On Deposit Accounts				
- On Savings Accounts				
5. F.D. Against L/C.	21,730,296		6,299,375	
6. Dr. Acharya	181	21,730,477	181	
7. Amount receivable from Schemes	-	-		6,299,556
TOTAL (A)		**37,977,558**		**27,225,621**
B. LOANS,ADVANCES AND OTHER ASSETS				
1. Loans:				
a) Staff (For HBA, Vehicle Advance and Computer)	1,531,968		1,820,947	
b) Other Entities engaged in activities/objectives similar to that of the Entity				
c) Amount receivable from Schemes - NPS			268,601	-
d) Amount receivable from Schemes (Overhead Chareges)	2,697,252	4,229,220	2,819,968	4,909,516
2. Advances and other amounts recoverable in cash or in kind or for value to be received:				
a) On Capital & Revenue Expenditure	10,861,432		23,305,876	
b) Prepayments(Cash Insurance)	1,092		1,092	
c) Advances to staff (For TA etc)	1,233,490		2,261,655	
d) Prepaid Medical Insurance Premium	145,087		145,087	
e) Festival Advance			375	
f) Prepaid subscriptions for journals	3,852,300		2,845,648	
g) Deposits kept with Govt. Agencies (MSEB, TELPHONE, GAS Cylinder etc.)	872,941	16,966,342	824,941	29,384,674
3. Income Accrued:				
a) On Investments from Earmarked/Endowment Funds	-		5,935	-
b) On Loans and Advances(HBA, Vehicle Adv. & Computer Adv.)	129,618			-
c) Accured int on Technology Dev Fund Account			2,501,344	
d) Amount receivable from INDO-TUNISIA	56,400		56,400	
e) Interest on F.D.R. - Union Bank of India			1,415,136	
4. Claims Receivable (TDS)	452,668		448,301	
5. Amount Receivable -Adv.given to MEF Scheme Staff				
6. Kumar Krishi Mitra Fellowship	31,281		31,281	
7. Royalty Receivable	10,000		10,000	
8. Vigyan Prasar				
9. Amount Receivable from MACS	8,280	688,247	111,613	4,580,010
10. Amount receivable for Parliamentary Standing Committee Expenses		-		311,313
TOTAL (B)		**21,883,809**		**39,185,513**
TOTAL (A+B)		**59,861,367**		**66,411,134**

M.A.C.S's Agharkar Research Institute, Pune - 411 004

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 12 : Income from Sales/Services

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Sales		
a) Sales of Finished Goods (Farm Produce)	645,683	1,111,687
b) Sale of Raw Material		-
c) Sale of Scraps		250
2. Income from Services		
a) Service Charges	1,059	710
b) SEM Charges		
c) Maintenance Services (Equipment/Property)		
d) Others (Currency Fluctuation Adjustment)		
e) Fees for Information (Right to Information Act)	1,002	136
Total (Rs.)	**647,744**	**1,112,783**

M.A.C.S's Agharkar Research Institute, Pune - 411 004

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 13 : Grants/Subsidies

Amount - Rs.

Particulars	Current Year	Previous Year
1. Central Government	120,690,000	145,000,000
Add: Unspent balance at the beginning of the year	51,608,362	43,844,570
Less: Unspent balance at the year end	464,350	51,608,362
	171,834,012	**137,236,208**
2. State Government	-	-
3. Government Agencies	-	-
4. Institutions/Welfare Bodies	-	-
5. International Organisations		-
6. Others (Specify)	-	-
Net Surplus of sale of Assets		
Total (Rs.)	**171,834,012**	**137,236,208**

M.A.C.S's Agharkar Research Institute, Pune - 411 004

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 14 : Fees/Subscriptions

Amount - Rs.

Particulars	Current Year	Previous Year
1. Entrance Fees (Library Membership fees)	24,932	11,902
2. Annual Fees(Licence fees)/Subscriptions	9,975	13,877
3. Seminar/Program Fees		-
4. Others (Ph.D.Tuition fee, Ph.D.Provisional Admission fee)	156,282	56,434
Total (Rs.)	**191,189**	**82,213**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 15 : Income from Investments

(Income on Invest from Earmarked/Endowment Funds transferred to funds)

Amount - Rs.

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

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 16 : Income from Royalty, Publication etc.

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Royalty	-	-
2. Income from Publications	8,970	7,655
3. Others (Sale of Tender Forms/I Cards)	20,000	23,550
4. Application Money	41,200	26,400
Total (Rs.)	**70,170**	**57,605**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 17 : Interest Earned

Amount - Rs.

Particulars	Current Year	Previous Year
1. On Term Deposits		
a) With Scheduled Banks	-	-
b) With Non-Scheduled Banks	4,843,232	6,230,492
c) With Institutions		
2. On Saving Accounts	531,456	908,275
a) With Scheduled Banks		
b) With Non-Scheduled Banks		
c) Post Office Savings Accounts		
d) Others M.S.E.B Deposit	43,672	
3. On Loans		
a) Employees/Staff (On HBA, Vehicle and Computer Advance)	247,247	175,572
b) Others (Interest on LTC Advance)		
4. Interest on Debtors and Other Receivables		
Total (Rs.)	**5,665,607**	**7,314,339**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 18 : Other Income

Amount - Rs.

Particulars	Current Year	Previous Year
1) Profit on Sale/Disposal of Assets:		
a) Owned Assets (Sale of Mahindra Jeep)		-
b) Assets acquired out of grants, or received free of cost		
2) Export Incentives realized		
3) Fees for Miscellaneous Services (Training Charges)		15,000
4) Miscellaneous Income	1,015	11,790
5) Lab Space Usage Charge		
6) Guest House Receipts	15,750	21,486
7) Hostel Fees Received	29,625	26,125
8) Medical Scheme for Retired staff	88,500	76,500
9) Late Fee for Ph.D. Tuition Fee	750	2,400
10) Laboratory Fees	42,000	8,000
11) F.D. Against L.C.	859,880	143,839
Total (Rs.)	**1,037,520**	**305,140**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

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

Amount - Rs.

Particulars	Current Year	Previous Year
a) Closing stock		
- Laboratory Consumables	144,507	151,000
- Finished Goods		
- Publications	21,527	23,919
	166,034	174,919
b) Less: Opening Stock		
- Laboratory Consumables	151,000	81,482
- Finished Goods		
- Publications	23,919	26,577
	174,919	108,059
Net Increase/(Decrease)	**(8,885)**	**66,860**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 20 : Establishment Expenses

Amount - Rs.

Particulars	Current Year	Previous Year
1) Salaries and Wages	76,185,526	65,538,626
2) Allowances and Bonus	657,851	169,821
3) Contribution to Provident Fund & New Pension Scheme	6,122,418	5,984,476
4) Contribution to Other Fund (D.L.I.F.)	30,993	32,426
5) Staff Welfare Expenses	4,121,900	3,443,044
6) Expenses on Employees Reitrement and Terminal Benefits	15,110,106	10,135,204
7) Stipend to Trainees	3,273,346	3,193,473
8) Encashment of Earned Leave for LTC	377,799	282,889
9) Reimbursement of Residential Telephone Expenses	208,936	184,213
10) Fellowship & Research Associateship	1,322,059	1,648,340
11) P.F. and N.P.S. Admn.Charges	517,986	459,288
	107,928,920	**91,071,800**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2014

Schedule 21 : Other Administrative Expenses

Amount - Rs.

Particulars	Current Year	Previous Year
ADVERTISEMENT & PUBLICITY	115,427	253,012
AUDITORS REMUNERATION	16,854	16,854
BANK CHARGES	29,697	13,082
CAMPUS MAINT. EXPS	1,309,720	1,054,321
CASH INSURANCE	3,559	3,628
CONSULTANTS ENGINEERS HONORARIUM		84,839
DATA BASE EXPENSES	236,775	1,179,234
ELECTRICITY & POWER	5,628,786	5,200,310
FARM EXPS	943,969	1,151,335
FIELD TOUR	131,842	347,696
GARDEN EXPS	79,601	204,508
HIRED LABOUR CHARGES	4,121,035	2,971,099
HINDI DAY EXPENSES	2,160	10,288
HONORARIUM	218,000	178,500
HOSPITALITY EXPS	379,677	218,636
INFORMATION TECH & NETWORKING	638,137	942,082
LABOUR & PROCESSING EXPS	210,988	546,987
LEGAL FEES	26,500	-
LIB MISC EXPS	165,815	41,753
LIVERIES	50,232	35,799
MEMBERSHIP FEE		14,600
NATIONAL TECHNOLOGY DAY EXPENSES	12,792	2,890
OFFICE EXPS MISC	94,895	73,964
PATENT RENEWAL CHARGES	8,000	34,000
PARLIMENTARY STANDING COMMITTEE EXPENSES	411,604	
POSTAGE, TELEPHONE & COMMUNICATION CHARGES	430,823	319,110
PRINTING & STATIONERY	806,789	792,363
PROF S P AGHARKAR DAY EXPS	168,477	123,148
PROFESSIONAL FEES	58,500	81,379
PROPERTY TAX	1,445,418	1,894,296
PURCHASES OF CHEMICALS & GLASSWARE	10,675,409	5,820,672
RENEWAL OF RECOGNITION FEE		72,000
REPAIRS AND MAINTANANCE	3,503,351	3,470,937
SCIENCE DAY EXPS	12,182	119,501
SECURITY SERVICE CHARGES	1,319,569	1,150,503
SEM CHARGES	6,400	9,900
SEMINAR EXPS	46,504	37,160
SERVICE TAX PAYMENT (NET)	156,937	
SUBSCRIPTION EXPS	4,095,904	7,400,629
TA/CONVEYANCE--INDIAN AND FOREIGN TOUR	1,006,680	796,407
VEHICLE RUNNING AND MAINT EXPS	165,050	196,305
VIGILANCE WEEK EXPS.		420
WATER CHARGES	717,384	810,084
TOTAL (Rs.)	**39,451,442**	**37,674,231**

M.A.C.S's Agharkar Research Institute, Pune - 411 004

Schedules forming part of Balance Sheet as at 31.03.2014

Schedule D

Amount - Rs.

Particulars	Current Year		Previous Year	
Other Fixed Assets				
Temporaty Structures			213,584	
Modular furniture for New Lab Bldg	-		429,604	
Books	449,176		567,814	
Construction of Buildings	212,131		1,456,792	
Computer / Peripherials / Softwares	893,780		136,226	
Office Furniture & Dead Stock	293,292		341,969	
Other Fixed Assets	772,318		-	
Construction of HT Substation			532,291	
App. & Equipments	45,169,811		10,474,347	
Equipments at Hol	121,317			
Transformer / Generator	2,266,739			
CC TV Works at ARI Campus	517,114			
Recarpeting of Existing Roads	1,150,054		1,862,736	
Construction of Temperary shed at Songaon	515,458			
Renovation of Canteen	1,329,408			
		53,690,598		**16,015,363**
Advance to Supplier for Equipments				
Applied Separations Inc.	2,113,139		2,113,139	
Bharat Chemicals			5,027	
Biolog Inc. USA	-		2,584,853	
Branson Ultrasonics (Asia Pacific) Co.Ltd.	-		419,277	
Bruker Axs Analytical Inst.Pvt.Ltd.	140,000		140,000	
C. DAC	158,673		158,673	
Camag - Switzerland	-			
Carl Zeiss	-		6,234,768	
CPWD	5,845,000		1,761,009	
Director TMC Actrec	-		1,500	
Dr. B.V. Rao IPMT	-		7,288	
Easy Comp Solutions	11,250		11,250	
FlyJac Logistics	352,516		352,516	
Freight Express	158,349		158,349	
Girikand Travel	-		36,869	
Growtech	-		124,440	

Particulars	Current Year		Previous Year	
Heidolph Instruments GmbH & Co.	-		276,710	
Inkroma	1,809,600		1,809,600	
Jeico Tech Co.Ltd.	-		905,048	
Khadi Gramodyog Seva	-		15,218	
Licor Inc.	-		3,822,990	
M M suppliers	-			
Mapple ESM Technologies Ltd.	121,500		121,500	
National Botanical Res.Institute	-		4,613	
New Brunswick Sci Co	-		1,000	
Nikon Corporation	-		712,223	
Oxford Instruments Analyticals	-		1,310,418	
Precious Scientific &Surgicals	-		2,750	
PSP Freight Lines Pvt.Ltd.	151,405		151,405	
Ratanmohan	-		2,866	
Raut Scientific & Surgicals	-		10,904	
Shri Sai Traders	-		800	
Sigma Aldrich Chemicals	-		14,710	
Sine Waves Computer services	-		8,320	
Vijay Chemicals	-		25,843	
		10,861,432		23,305,876
TOTAL		**64,552,030**		**39,321,239**

As per our report of even date

For **MARATHE PADHYE & ATHALYE,**

Chartered Accountants

Sd/-

Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

21th August, 2014

National Science Day

Kisan Mela, 26 February 2014

On the occasion of the National Science Week an interactive programme was organized at the Hol farm to create awareness among farmers about cultivation practices and new wheat varieties developed by the institute. Over 100 farmers participated.

Maharashtra Association for the Cultivation of Science
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