MACS

Annual Report 2012-13

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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Agharkar Research Institute

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Dr GK Wagh

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Executive Summary

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

Dear Friends,

I have the pleasure of presenting to you the salient events of the year 2012-13. Maharashtra Association for the Cultivation of Science has been following its objectives of promoting science assiduously. Through Agharkar Research Institute, MACS has continued to encourage research focussing on national interest. A three-pronged approach to life science research via microbial, plant and animal sciences has earned ARI successes in both fundamental and applied areas.

Improvement in crop varieties of wheat, soybean and grapes has been the mainstay of agricultural research at ARI. The several varieties developed so far have contributed in increasing the national crop productivity and individual incomes of small farmers. This year soybean variety MACS 1281 was identified as a high yielding variety for cultivation in Southern Zone. It is worth mentioning here that soybean research at ARI has fairly contributed in increasing the national soybean production. Equally, the bread wheat variety MACS 6222 has been released for cultivation in Peninsular Zone, as it surpassed the popular varieties HD 2189 and GW 322. Similarly, the variety MACS 6478 has shown great promise in respect of yield, chapati making and nutritional aspects in All India Coordinated trials and, therefore, has been identified for cultivation in the above zone.

Non-conventional energy research at ARI has long focussed on biogas and has received national acclaim. Recently, research on bio-hydrogen has gained momentum with the identification of *Clostridium* sp. DMHC-10 sp. nov. which is the most efficient bio-hydrogen producing mesophilic bacterium.

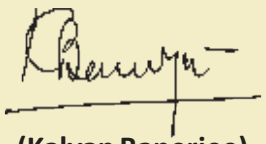
Nanobioscience, the latest research branch at ARI, has made quick progress in the applications of nanoscience and nanotechnology in health, agriculture and environment. It is encouraging to note that two know-hows related to nanomaterials were licenced to a private company during the year.

Although research happens to be the core area of MACS' activity, MACS is also into popularisation of science. An activity in this respect was the workshop organised on scientific writing in Marathi. The workshop was inaugurated at the hands of Prof. Nagnath Kottapalle, President, Akhil Bharatiya Marathi Sahitya Sammelan, 2013. The workshop received a good response with participants ranging from amateurs to professionals.

Yet another activity which the MACS has been pursuing relentlessly is the home gardening course. The course has been well received by urbanites who have appreciated its practical and theoretical content. Field botany and identification of plants is a new course which has been drawing attention of nature lovers.

MACS has been organising lectures in the memory of Prof. SP Agharkar, Founder Director, MACS and Dr GB Deodikar, Director (1960-80), MACS Research Institute.This year Prof. SP Agharkar Memorial Oration was delivered by Prof. Tej Pal Singh, Distinguished Biotechnology Research Professor, All India Institute of Medical Sciences. Noted wheat cytogeneticist Prof. PK Gupta delivered Dr GB Deodikar Memorial Oration. Shri GB Joshi Memorial Oration, instituted by Dr AB Joshi, Past President, MACS was delivered by Dr K Ramasamy, Vice-Chancellor, Tamil Nadu Agricultural University. MACS has also been instituting awards in the name of renowned plant scientists, viz. Shri VP Gokhale Award, Shri RB Ekbote Award, on the donations made by their relatives. Dr Jagdish Kumar, Head, IARI Regional Station, Wellington was awarded Shri VP Gokhale Award.

With this variety of activities, MACS is firmly progressing on the laid down objectives. I take this opportunity to congratulate the life members of MACS who have been contributing their experience in all its endeavours.



(Kalyan Banerjee)

23 September 2013, Pune

From the Director's Desk

I am indeed pleased to present this annual report. Over the years MACS' Agharkar Research Institute has become a prime institute in the life sciences arena. The diversity of research carried out at the institute, ranging from nanostructures to mega-organisms, makes it stand out among other more specialized institutes of the country. I consider this diversity as our inherent strength that can be exploited for developing stronger inter-disciplinary programs in coming years.

This time I have made a conscious effort to present a crisp report that will put you at ease in drawing the most relevant details of our research. It also presents research highlights in a more informal format which, I hope, will be appreciated by our non-specialist readers.

I will now present some of the salient research outcomes of the current year:

- A high yielding soybean variety MACS 1281 has been identified for its cultivation in Southern Zone. This variety is resistant to major insect pests, diseases, and pod shattering habit.
- Three microbial consortia capable of degrading total petroleum hydrocarbon (TPH) from oil field produced water have been developed. The ultimate aim of this ONGC sponsored research is to make the produced water suitable for reinjection into the oil reservoir.
- Our findings show that catalytically inactivated but structurally intact enzymes can be used as biorecognition elements for developing a variety of applications, e.g. detection of urinary tract infections, dermatophytic mycoses, clarification of fruit juices, detection of milk adulterants, etc.
- Dextran coated Lanthanum Strontium Manganese Oxide (LSMO) nanoparticles, having potential use in cancer treatment by hyperthermia have now been shown to work also as negative contrast agent in MRI.
- Hydra, is an animal with a remarkable regeneration capacity and shows no signs of organismal aging. Our study shows that XPF and by extension, the NER pathway is highly conserved during evolution. The prominent expression of an NER gene in interstitial cells may have implications for the lack of senescence in hydra.
- Perivitelline fluid of horseshoe crab embryos has been shown to contain a 27 kDa lectin with significant pro-angiogenic activity, for the first time.
- In our continued work on taxonomy of micro- and macro-fungi, several new species have been identified. *Ellisembia karadkensis* has been established as a species new to science while *Agaricus bambusigenus* Berk. & Curt., has been reported for the first time from India.

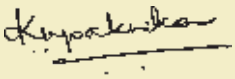
- The work on Quality Standards of Indian Medicinal plants has led to the preparation of Monographs on eight medicinal plants.
- Insulin like protein purified from fresh leaves of *Costus igneus* has shown promising anti-diabetic activity and a potential for development as a possible oral supplement for treatment of diabetes.
- Ichnological studies of the Jaisalmer Formation have resulted in the identification of 42 ichnospecies. Of these eight forms are reported for the first time from this basin.

Transfer of two nanotechnology based products to industry needs special mention. DNA*RAP* is a kit for rapid one-step isolation of bacterial DNA and UTI*RAP* is kit for rapid antibiotic susceptibility testing and identification of uropathogens.

Other notable achievements of the institute include publication of sixty research papers, award of PhD degrees to twenty students, operation of sixty sponsored projects and a healthy increase in external funding. These achievements have come from the sincere efforts of my colleagues who deserve to be congratulated.

This Annual Report demonstrates how much has been achieved over the past year. We have a lot to be proud of and we will continue to build on this foundation.

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



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

23 September 2013, Pune

Biodiversity

Various aspects of biodiversity of microorganisms, plants and fungi have been studied. Some notable results are presented here.

Bacteria

Isolation and characterization of obligate anaerobic bacteria from human gut

Studies on human gut microflora are in the limelight owing to their multivalent interaction with the host. Pure culture studies on obligate anaerobic bacteria are scanty. In the present study 65 obligate anaerobes were obtained. Five isolates were identified to the species level. Out of 65 isolates identification of 49 was completed.

Forty isolates were found to produce intracellular vitamin B_{12}. Among all the isolates *Bifidobacterium adolscentis* RSBHI-2 produced maximum vitamin $B_{12,}$ca.12 ng/g. None of the isolates produced extracellular vitamin B_{12}.

Sixteen isolates showing maximum cholesterol reduction above 25% (w/v) were tested for cholesterol reductase activity in presence and absence of bile. All the isolates produced cholesterol reductase intracellularly and extracellularly and further intracellular cholesterol reductase activity was greater than extracellular among all the isolates ($P<0.05$).

Fungi and lichens

Biodiversity and systematics of micro- and macro-fungi

Forests of the Western Ghats were explored for the fungal diversity of micro- and macro-fungi, *ex situ* conservation and their documentation.

Microfungi

Fungal treasure	Search for microfungi from the Western Ghats has established *Ellisembia karadkensis* as a species new to science. Similarly *Ellisembia magnibrachypus* is found to be a new combination

Sacred groves of Tamhini Ghats (Mulshi), Malshej, Mahabaleshwar, and local areas were explored for collection of different samples from forest plants/diseased crops like onion/wood/cattle dung and rhizospheric soil. Several plant pathogenic bioagents, coprophilous and saprophytic fungi of different taxonomic groups like Hyphomycetes, Coelomycetes, Zygomycetes, Basidiomycetes and Oomycetes were isolated. Of the several fungi identified *Ellisembia karadkensis* was established as a species new to science and *E. magnibrachypus* turned out to be a new combination (Figure 1).

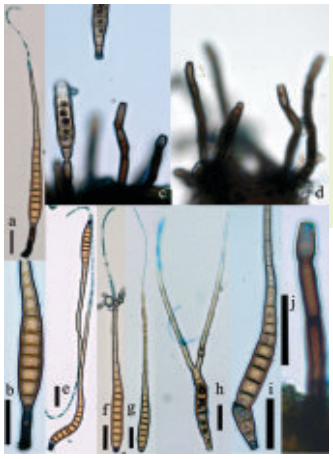


Figure 1 *Ellisembia karadkensis* (holotype): a–b. Conidia attached to conidiophores. c–d. Conidiophores and conidial development. e–h. Variation in conidia. i. Conidium with curved base. j. Conidiophore with conidiogenous cell. Bars= 20µm.

Nine isolated fungi were studied in detail and identified as *Conidiobolus coronatus* (2 isolates), *C. couchii, C. macrosporus, Conidiobolus* affinity to *C. paulus*, *Conidiobolus incongruus*, *Conidiobolus* aff. to *C. rugosus* and *Basidiobolus ranarum* (two isolates). These were collected from plant litter samples.

Endophytic fungi

Chemical factories	Fungi are nature's chemical factories. A fungi *Colletotrichum lini* was found to have moderate antimicrobial activity whereas *Nigrospora* sp. showed presence of phenolic compounds and anthraquinones

Several classes of natural products are reported from endophytic fungi including volatiles organic compounds (VOCs) having antibiotic potential. Hence work was initiated on biology and antimicrobial potential of endophophytic fungi.

Endophytic fungal isolates were obtained from *Trachycarpus fortunei* (15), *Polygala elongata* (30) and *Gloriosa superba* (45). These were identified. Of these *Colletotrichum lini* was found to have moderate antimicrobial activity against selected bacteria and fungi. The phytochemical analysis of crude extract of *Nigrospora* sp. showed presence of phenolic compounds and anthraquinones. Minimum inhibitory concentration of the crude extract was determined.

Macrofungi

New to science!	Diversity studies of macrofungi have led to the discovery of *Hygrocybe*, *Boletus, Polyporus* and *Leccinum* sp. as new to science, whereas *Agaricus bambusigenus* Berk. & Curt. is reported for the first time from India

About 80 macrofungal samples including edible, mycorrhizal and plant pathogenic fungi were collected from different vegetation communities of mixed forests of Pune and adjoining areas of Sinhgad and Mulshi (37) and dipterocarp forests of Sirsi and its adjoining forest area in Karnataka (43). The 37 samples were assigned to 13 families and four orders Agaricales, Hymenochaetales, Phallales and Polyporales. The other 43 samples were assigned to 14 families and 6 orders. Of these, species of the genera *Hygrocybe*, *Boletus, Polyporus* and *Leccinum* were found to be new to science, while *Agaricus bambusigenus* Berk. & Curt. was found to be the first report from India.

Biodiversity of lichens in Western Ghats of India

'*Pattharphool*' or lichen	The lichen diversity of the Western Ghats has attracted attention by the identification of 17 species of *Graphis* which includes 4 new species and 13 new records to India

Morphological, anatomical and chemical studies of over 80 specimens of family *Graphidaceae* from the Western Ghats of India have resulted into the identification of 17 species of *Graphis*, including 4 new species and 13 new records to India. Morphological, anatomical and chemical studies of over 50 foliose lichen specimens were completed. The detailed taxonomic descriptions together with the notes on habitat, geographical distribution, and a short discussion on the phylogenetic relationship of the species have been completed.

Molecular systematics and phylogeny of fungi

Morphology and molecular phylogeny of a new genus of order Onygenales (Ascomata)

New, new, new	Fungal taxonomy Is proving to be an exciting field. New fungi are being unearthed. As a result a new keratinophilic genus was recognized; a new species *Gymnoascus* was isolated; another new species *Arthrinium rasikravindrii*, isolated from Svalbard, Norway by Indian mycologists was morphologically close to *A. phaeospermum*

A new keratinophilic genus belonging to family Onygenaceae was recognized based on morphology of its ascomata and typical punctate ascospores. Phylogenetic study clearly showed separation from the morphologically closest genus *Auxarthron*, which is monophyletic in nature.

A new species of genus *Gymnoascus* was isolated from soil. Phylogenetically the new species is close to *G. petalosporus*, which is different morphologically.

A new species *Arthrinium rasikravindrii*, isolated from Svalbard, Norway by Indian mycologists and described on the basis of distinct morphology of conidia and sequence analysis of ITS rDNA is morphologically close to *A. phaeospermum*. Both produce similar kind of lenticular conidia, but the former also produces another type of conidia i.e. anomalous conidia that are larger, balloon shaped not found in *A. phaeospermum*. During the study isolates previously identified as *A. phaeospermum* from China and Japan were re-determined as *A. rasikravindrii*. Phylogenetic analysis of 10 related species of *Arthrinium* using neighbour joining method placed *Arthrinium* spp. into three clades.

Plants

Collection, conservation and multiplication of germplasm of wild resources

Plant community studies on selected grasslands of Western Maharashtra

Eight sampling locations in districts Ahmednagar (Mahatma Phule Krishi Vidyapeeth), Dhule (Laling, Lamkani), Pune (Waghapur, Supe) and Akola (Shisamasa, Wadala, Karanja) in Maharashtra were studied for understanding the ecology of grasslands. Rainfall (medium-3, low-5) and protection (sanctuary-3, community-3, unprotected-2) were the two criteria for assessing the grasslands. The comparison of diversity indices (Shannon H) showed that protected grasslands were rich in species diversity as compared to unprotected grasslands.

Documentation of palatable and non-palatable species was done based on personal observations and discussions with pastoral communities. The protected grasslands showed dominance of palatable species as compared to unprotected areas where there was dominance of non-palatable species. Community managed grasslands were dominant in palatable species compared to government protected grasslands.

Digitized inventory of medicinal plant resources of Maharashtra

A unique database	A unique database of medicinal plants was developed for Maharashtra. The database would be made accessible on the internet by the Rajiv Gandhi Science and Technology Commission

A unique database has been developed under this multi-centered project with 14 collaborators from Maharashtra. Total 130 high valued medicinal plants (and 23 other local value medicinal plants taking total number to 153 resources) were mapped covering 1710 locations of 290 talukas from 34 districts. The database also records 512 local informants, 94 industries and 1608 references related to these selected species. Database has been supplemented with field and scanned herbarium images. About 3000 photo documentations are available in image gallery. Total 4500 herbarium specimens of these selected medicinal resources were deposited in AHMA.

Recovery of rare endangered threatened (RET) species of *Ceropegia* from Western Ghats

Rare Endangered Threatened	RET species have been a cause of concern. Such species will be restored in their natural habitat with the help of the Forest Department

Under this project efforts are being made to micropropagate RET *Ceropegia* species viz. *Ceropegia rollae* Hemadri, *Ceropegia maccannii* Ansari, *Ceropegia mahabalei* Hem. & Ansari and *Ceropegia odorata* Nimmo ex Hook f. of Western Ghats. The project aims at restoring these selected species in their natural habitat with the help of Forest Department. Hardening of developed sapling and formation of tuber are key steps to achieve this target. The protocol has been standardized for tuber formation.

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

Rai, Chaura and Ahpe areas of Bhimashankar were studied to document various growth stages of food species of giant squirrel. The details of available food sources were recorded and a table of food availability was prepared.

Inventorization of flora and fauna of selected sacred groves from Pune district

Detailed documentation of flora and fauna of 15 sacred groves was done. The primary documentation is based on opportunist sighting and general check listing. Quantitative assessment of floristic diversity was also done.

Fly-trap pollination in Indian *Ceropegia* L. (Apocynaceae: Asclepiadoideae)

The studies on pollination ecology, especially on the Western Ghats, which is the possible loci of diversification of the genus *Ceropegia* in India, revealed that all were mostly visited by flies, followed by beetles, ants, wasp parasitoids, bees, and mantids (Figure 2). The fly families Anthomyiidae, Empididae and Muscidae are being reported as visitors to *Ceropegia* flowers for the first time. Flower-based predation by spiders, ants and mantids is another important aspect which was discovered while studying pollination. These ambush predators of legitimate pollinators are probably important impact factors in the pollination process.

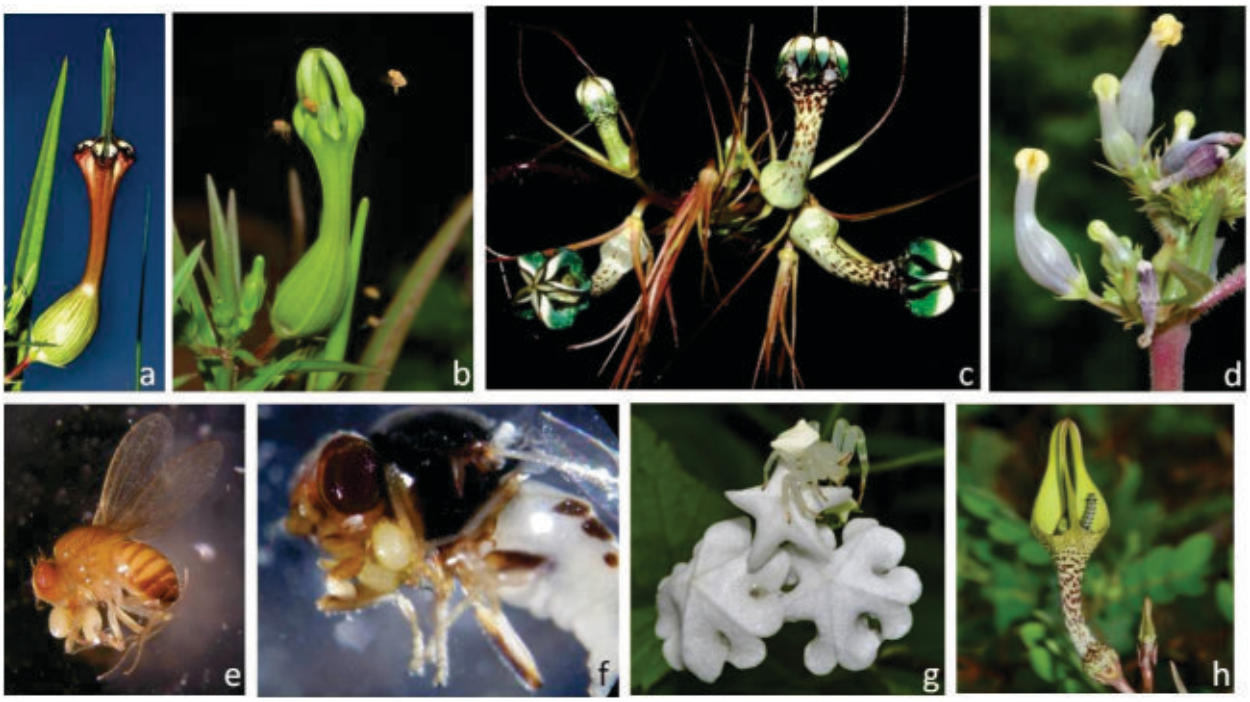


Figure 2 *Ceropegia* pollination. **a.** *Ceropegia mahabalei*; **b.** *Ceropegia mohanramii*- note the Drosophiloid flies on flower; **c.** *Ceropegia fantastica*; **d.** *Ceropegia maccanii*; **e.** Drosophiloid fly with pollinarium; **f.** Milichid fly with pollinarium; **g.** Thomsid spider on *Ceropegia huberi* - a flower-based predation; **h.** Caterpillar of Plain Tiger on *Ceropegia juncea*

Crop Improvement

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

Biotechnology

New sources of leaf rust resistance	Leaf rust is a virulent disease affecting the wheat crop. A novel leaf rust resistance gene has been found in 'Malvi local'

Identification and mapping of markers linked to leaf rust resistance in Indian local durum genotype Malvi local

Inheritance studies on resistance to leaf rust pathotype 77-5 in Indian local durums, resistance in genotypes AO90 and Malvi local revealed that resistance was due to single dominant gene and that in Haura due to single recessive gene. Malvi local was also resistant to pathotype 104-2 and on the basis of genetics the gene present in Malvi local appeared to be novel. Mapping of the resistance in Malvi local was undertaken.

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 underway.

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

Along with banana, the protocols for testing date palm samples were standardized in the laboratory conditions. The samples of tissue culture raised plants provided by production facilities were tested for quality (genetic fidelity) using molecular markers. More than 150 banana samples and 22 date palm samples were tested.

Tissue Culture

Agri-culture	Experiments have succeeded in increasing biomass of the roots without antibiotics for bi-production of antioxidants

Doubled haploid production in wheat

Efforts are being made to develop doubled haploids production facility to establish faster homozygosity in wheat hybrids/ mapping populations (Figure 3).

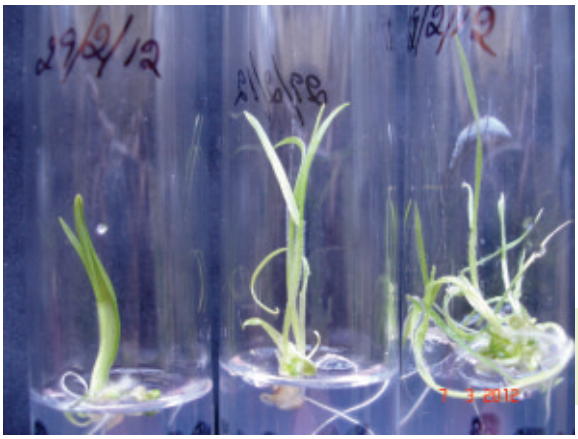


Figure 3 Haploid wheat plantlet obtained from wheat x maize growing in culture

Hairy root culture of *Vitis* sp. for secondary metabolite production

Hairy root cultures were obtained from *Vitis* transformation with *Agrobacterium rhizogenes*. The biomass of the roots increased by decreasing antibiotic concentration.

Wheat Improvement

Targetting bumper wheat production

Research on wheat has yielded encouraging results. Variety MACS 6478 was tested in the final year of advanced varietal trial. It showed productivity of 46.4 q/ha with 3.3% yield gain over best check. 109 cultures were found resistant to both leaf and stem rusts. Eight wheat entries were found resistant to Ug99. Indo-Australian project for greater water use efficiency in wheat is giving encouraging results. Recently released variety MACS 6222 showed average of 15.5 % yield gain over popular cultivars

Coordinated wheat improvement programme

Wheat entry MACS 6478 was tested in final year of Advanced Varietal Trial (AVT) for timely sown irrigated conditions in Peninsular Zone. It showed productivity of 46.4 q/ha with 3.3% yield gain over best check. It also ranked second in AVT-I as well as in NIVT 2 with constituting first non-significant group in PZ. Based on the performance under coordinated trials in different zones, four entries were promoted to AVT first year. MACS 5022 was promoted to second year of testing under special trial for semi-dwarf dicoccums. Fourteen entries were included in initial varietal trials (NIVT &Spl-trial-DIC) for further testing.

Station trials for wheat improvement

During 2011-12, total 379 entries were evaluated under replicated station trials of which 34 were significantly superior to checks and 126 entries were observed under first non-significant group.During current season, 381 cultures were tested under replicated station trials of which 168 were durums, 168 aestivums and 45 dicoccums. Of these, 126 were under rainfed conditions and rest under irrigated timely sown conditions.

Breeding programme for wheat improvement

230 crosses were attempted. These include 102 straight crosses and 128 back/ three-way crosses. Of these 102 straight crosses, 63 were among aestivums, 34 durums and 5 dicoccums. Under breeding material for irrigated and rainfed conditions uniform progenies were bulked in F5/F6/F7 generations. On the basis of plant type and rust reactions 2029 progenies and 790 bulks were selected.

Multilocational germplasm evaluation of wheat genotypes (NBPGR)

Pathological observations were recorded for leaf rust and stem rust. A total of 129 cultures were resistant and 189 moderately resistant to black rust, while 195 were resistant and 149 moderately resistant to brown rust. Overall, 109 cultures were resistant to both leaf and stem rusts.

Wheat grain sample collection from markets and farmers for quality and pathological investigations

46 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 are being conducted on farmers' fields to evaluate the impact of latest improved varieties over the previously released/old varieties. Recently released variety MACS 6222 showed average of 15.5 % yield gain over popular cultivars during 2011-12. During current season, eight FLDs were conducted on 8 ha area. The test varieties were MACS 6222 (aestivum) and NIDW 295 (durum). The growth of trials was satisfactory and data will be collected from the farmers.

Wheat breeder seed programme

About 200 quintal of breeder seed was sold to different agencies for Rabi 2012. Certified seed generated from this may cover around 1.80 lakh ha area in coming years with contribution of 5.5 lakh tonne wheat production in India. Breeder seed production programme was taken on about 10 ha area so as to achieve a target of 310 quintal for Rabi 2013.

Improvement of leaf rust resistance in bread wheat variety MACS 2496 and initiatives for combat against probable threat of pathotype Ug99

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

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 received under the project. In the Hill plot trial C306 demonstrated exceptionally well for all traits at Pune. 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 the root penetration and increasing the productivity. Leaf vigour trials on genotypes which gave on par grain yield would be used in the breeding programme.

In the tillering (Tin gene) experiment thirty Australian wheat genotypes (fifteen pairs) were evaluated.Five'*Tin'* gene genotypes gave increase in tiller number, biomass and grain yield compared to the genotypes without '*Tin'* gene**.** Grain yield recorded highest positive significant correlation with biomass followed by harvest index, plant height, and Tillers. Siv genotypes gave on par grain yield on check varieties.

Soybean Improvement

Soybean occupies first place among the oilseed crops of India

Research on soybean has led to identifying a high yielding variety MACS 1281 for cultivation in Southern Zone. MACS 1473 has shown 22.20 % oil content. MACS 1340 recorded maximum seed yield of 3917 kg/ha in AVT I. 100% organic management gave significantly higher seed yield of soybean. Improved technology increased soybean yield by 9.9%

Identification of soybean variety MACS 1281

A high yielding soybean variety MACS 1281 was identified for its cultivation in Southern Zone (Figure 4). This variety is resistant to major insect pests, diseases and pod shattering habit.

Figure 4 Newly identified high yielding soybean variety MACS 1281

Screening of soybean for high oil content and earliness

Nine MACS soybean lines showed more than 20% oil content. MACS 1473 showed maximum oil content (22.20 %).

Station trials for soybean improvement

57 new elite breeding lines were tested in two graded replicated trials. Of these, 13 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-I in Southern and North Eastern Zone whereas MACS 1311 and MACS 1336 were promoted to AVT-II of Southern and North Eastern Zones, respectively. In the IVT conducted at Hol Farm, MACS 1394 gave significantly high yield (3928 kg/ ha) followed by MACS 1416 (3928 kg/ ha) and MACS 1407 (3503 kg/ ha). MACS 1340 recorded maximum seed yield of 3917 kg/ha in AVT I and MACS 1311 (3350 kg/ha) ranked second in AVT II at Hol farm.

Agronomy research in soybean

Two test entries viz. KDS 344 (4180 kg/ ha) and DSb 20 (4094 kg/ ha) were significantly superior over the best check variety RKS 18 (3667 kg/ha). 100% organic management produced significantly higher seed yield of soybean than 100 % inorganic management and 50 % organic + 50 % inorganic management system. During *rabi* 2011-12, wheat with 100% inorganic management system produced significantly higher soybean equivalent yield, net returns and B:C ratio. Water spray gave significantly higher yield than the anti-transpirant spray treatments. In a demonstration on yield maximization with use of optimum package of cultivation recommended for the Southern Zone, newly identified soybean variety MACS 1188 gave seed yield of 3040 kg/ha.

Entomology research in soybean

Results of entomology experiments indicated low to moderate infestation of stem fly, leaf roller and tobacco

caterpillar. Categorization of the AVT test entries for resistance against stem fly revealed three entries to be highly resistant to stem fly. On the basis of number of larvae/meter row length seven entries were highly resistant to leaf roller. Twelve entries were categorized as resistant high yielding (R-HY) entries and eleven entries were susceptible high yielding (S-HY, tolerant) on the basis of Maximin-minimax method. No significant effect of variable spray volumes on insect damage was observed. However, among insecticides Rynaxypyre was found to be effective against leaf roller. Sutathion (Trizophos 40 EC) and Spinetoram (12 SC) were found to be effective against tobacco caterpillar.

Soybean breeder seed production

Breeder seed of MACS 450 (9.90 quintal) and JS 335 (81 quintal) were supplied to public and private seed multiplying agencies and private farmers.

Soybean front line demonstrations (FLD)

Nine front line demonstrations were conducted on farmers' fields in Satara district to evaluate the impact of improved technology (IT) over farmers' practice (FP) using MACS 1188, MACS 450 and RKS 18 soybean varieties. Adoption of improved technology increased soybean yield compared to farmers' practice by 9.9% and gave additional net returns.

Grape Improvement

These grapes ain't sour! Cheers	Grape variety H-516 and seedless variety ARI–302 have performed well on farmers' fields. Four hybrids have shown better performance for bunch weight, berry weight and berry size. Production of grape wine using partial chaptalization is being standardized

Thirty-four wild genotypes from family Vitaceae were collected from Karnataka, Mumbai and nearby areas. Photo images for habit, habitat and other phenological stages like flowering, fruiting and seeds and GPS data were recorded at every location. Morphological variation was observed in the collection from different locations.

Digitized monograph of wild relatives of grapes

Haritarium (*Harit* – Green; *arium*– House/ storing place) data for three species of *Ampelocissus* and two species of *Cyphostemma* were completed. H-516 and seedless variety ARI–302 performed well in farmers' fields. Hybrid H-516 is being used for raisin purpose in Nasik region.

50 inter- and intra-specific cross combinations were attempted using 15 cultivars and 23 existing hybrids as female parents to introduce desirable fruit qualities and disease resistance from which 1819 seeds were harvested. Pollen of five seedless varieties was used for direct and back crosses.

Out of sixty-two hybrids evaluated for their fruit quality four hybrids showed better performance for bunch weight, berry weight and berry size.

Research work for production of grape wine using partial chaptalization method is underway. Cabernet Sauvignon, Sharad Seedless for red wine and Sauvignon Blanc for white wine were used in this programme. This process is being standardized.

Developmental Biology

Conservation of the nucleotide excision repair pathway: Characterization of hydra *Xeroderma Pigmentosum Group F* Homolog

Why then do humans age?	Hydra shows no signs of organismal aging. Interstitial cells may be implicated in this lack of senescence in hydra

Hydra, one of the earliest metazoans with tissue grade organization and nervous system, is an animal with a remarkable regeneration capacity and shows no signs of organismal aging. We have for the first time identified genes (*XPA* through *XPG* and *CSA* and *CSB*) of the NER pathway from hydra. Cloning and characterization of hydra homolog of *XPF* gene is reported here (Figure 5). *In silico* analysis shows that amino acid sequence of hydra XPF is very similar to its counterparts from other animals, especially vertebrates, and shows all features essential for its function. These features include nuclear localization signals, ERCC protein-4 domain and nuclease motif. Homology modeling reveals high structural similarity between hydra XPF and solved crystal structures of various XPF Domains. *In situ* hybridization shows that hydra *XPF* is expressed prominently in the multipotent stem cell niche in the central region of the body column. Cells in the ectoderm of the diploblastic hydra express higher levels of *XPF* as compared to those from endoderm. Interstitial cells, a multipotent and rapidly cycling stem cell lineage of hydra, express higher levels of *XPF* mRNA than other cell types. These data show that *XPF* and by extension, the NER pathway is highly conserved during evolution. The prominent expression of an NER gene in interstitial cells may have implications for the lack of senescence in hydra.

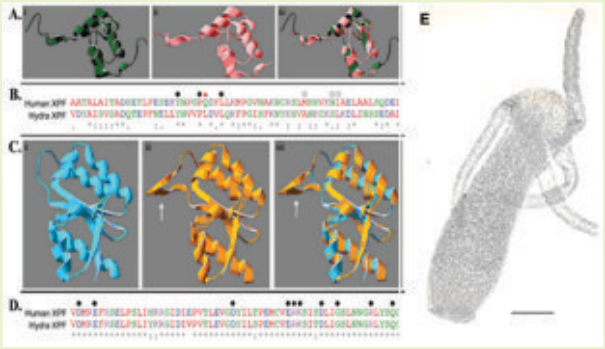


Figure 5 Comparison at structure and sequence levels of hydra XPF regions with corresponding regions from other XPFs

A. Homology modeling for ERCC1-binding domain. i. Structure of B-chain of human XPF-ERCC1complex. ii. Predicted structure of ERCC1- binding region of hydra XPF. iii. Overlap of 2Ai, 2Aii. B. Sequence alignment of ERCC-1 interaction domains from human and hydra XPF. 3 out of 7 residues involved in interaction are conserved (filled circle) while 3 more are replaced by conservative substitutions (open circle). The residue at one position (triangle) is not conserved between the two species. C. Homology modeling for the nuclease motif containing ERCC4 domain. i. Structure of *P. furious* endonuclease domain. ii. Predicted structure of ERCC4 region of hydra XPF iii. Overlap of 2Ci, 2Cii (arrows show extra pair of β sheets present in hydra XPF) D. Alignment of sequence around the nuclease motif of human and hydra XPF. Residues important for catalysis (filled circle) are completely conserved between the two species. E. *In situ* hybridization using biotin labeled probes. A representative hydra polyp shows that XPF mRNA is present mainly in the central region of the body column but decreases towards extremities. Scale bar = 200 mM

Enhancement of angiogenesis by a 27 kDa Lectin from perivitelline fluid of horseshoe crab embryos through upregulation of VEGF and its receptor

Don't crab

Search for natural biomolecules that can either enhance or limit the formation of new blood vessels has led to the discovery of a promising biomolecule from the horseshoe crab

Angiogenesis, the expansion of a capillary network, is implicated in several pathological conditions. Drug-based inhibition of angiogenesis is being explored as therapy. Conversely, therapeutic angiogenesis contributes to control conditions such as ischemia. Hence, there is a constant search for natural biomolecules that can either enhance or limit the formation of new blood vessels. Earlier study had shown that treatment of cultured chick embryos with whole perivitelline fluid (PVF) and a 27 kDa lectin (Figure 6), a major protein constituent obtained by fractionation of PVF from stage 19 embryos of the Indian horseshoe crab, *Tachypleus gigas* Müller, leads to enlargement of the heart. Increased hematopoiesis and blood flow was also observed in these chick embryos, pointing toward a possible pro-angiogenic effect. In the present study, this effect of PVF and the purified lectin has been examined using the *in vivo* chick embryonic chorioallantoic membrane (CAM) assay. It has been found that PVF and the 27 kDa lectin possess pro-angiogenic activity. Enhancement in number and diameter of blood vessels after treatment with PVF and lectin suggested their pro-angiogenic effect. Both these treatments caused comparable increase in the quaternary vessels, suggesting that other proteins from PVF may not have any significant effect on angiogenesis.

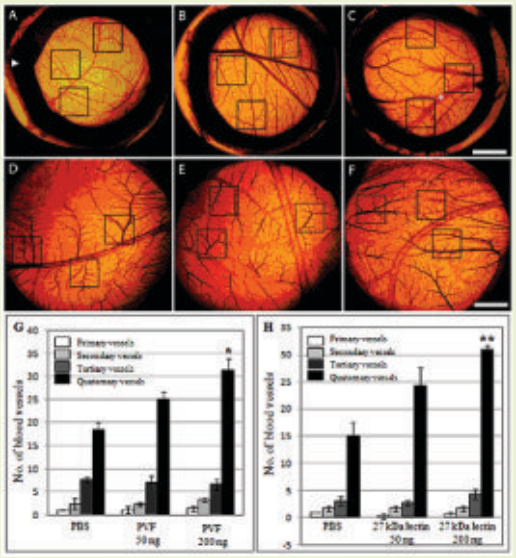


Figure 6 Induction of angiogenesis by PVF and a 27 kDa lectin of horseshoe crab embryos

Embryos were treated with whole PVF and the 27 kDa lectin on day 10, and the effect on sprouting of blood vessels was observed after 72 h. Increase in the number and size of blood vessels was observed with increased concentration of PVF (B and C) and the 27 kDa lectin (E and F) as compared to controls (A and D), suggesting a pro-angiogenic effect. Black squares represent comparable areas chosen for quantitation of blood vessels. The white * represents a blood vessel connecting the growing CAM and the embryo, and hence was not used for counting. The arrowhead represents the Whatman filter paper ring. Bar = 1 mm. Quantitation of the blood vessels was done by counting the primary vessel and the secondary, tertiary, and quaternary branches arising from the primary vessel, manually in each area, and histograms were plotted. A significant increase in the number of quaternary vessels was observed with 200 ng of PVF (G) and 200 ng of the 27 kDa lectin (H) as compared to controls. Vertical bars represent standard deviation, while * and ** denote statistical significance ($p < 0.01$ and $p < 0.001$, respectively).

In order to study the influence of lectin from PVF on the expression of angiogenesis regulatory genes, viz., *VEGF*, *KDR*, and *FGF-2*, CAMs were treated with 50 and 200 ng of purified lectin, and quantitative RT-PCR was performed for the genes of interest. Treatment of CAMs with the lectin for 24 h resulted in a significant upregulation of *VEGF* and *KDR*, which plateau after 72 h while no significant change was observed with *FGF-2* expression. This effect of lectin appears quite specific, as under identical experimental conditions, expression of *FGF-2* remained unaltered. The data strongly suggest that a pro-angiogenic effect of lectin and also PVF is mediated through upregulation of VEGF and its receptor, KDR, and is the underlying cause of observed enhancement of angiogenesis in the CAM assay. The present study thus demonstrates for the first time that

perivitelline fluid of horseshoe crab embryos contains a 27 kDa lectin with significant pro-angiogenic activity, which is exerted through simultaneous upregulation of expression of genes encoding VEGF and its receptor.

Neural development and disease

Clearing the 'Fog'	Studies on molecular mechanisms that regulate neural development have led to the identification and cloning of Fog regulatory regions

We are interested in molecular mechanisms that regulate neural development in *Drosophila melanogaster* and the underlying cellular and molecular basis of neurodegeneration in human neurodegenerative disorders.

An important function performed by glia is that of ensheathment, which, in addition to being protective, helps compartmentalize the nervous system into distinct functional units. In *Drosophila* embryos, interface glia ensheath the longitudinal tracts of the ventral nerve cord while the subperineurial glia ensheath the entire central nervous system to give rise to the blood-brain-barrier. The process of ensheathment involves growth and extensive cell shape change that is likely to be regulated by intrinsic glial as well as neuronal factors. Fog is one such a secreted signaling factor that regulates this process. An early function of Fog is to regulate cell shape change during gastrulation. Genetic studies suggest that Fog signals via a G-protein coupled receptor to mediate downstream cytoskeletal changes essential for cell shape change. However, the mechanism of Fog signaling and the regulation of its expression in glia is poorly understood. Expression of *fog* mRNA in the embryonic nervous system is observed primarily in interface glia which ensheath the axon longitudinal tracts. To understand the regulation of *fog* expression in glia, we have conducted an in-silico analysis of the *fog* regulatory region. Based on these analyses, we have identified and cloned two non-overlapping regulatory regions and generated GAL4 reporter lines using these sequences. Detailed analysis will help determine the tissue specific expression pattern of these lines. Using a similar approach we are generating tools that will allow direct visualization of embryonic glia independent of the UAS-GAL4 transactivating system. Using enhancers of genes known to express in embryonic glia or subsets of glia, we have generated reporter constructs. These will be expressed in *Drosophila* for further characterization and analysis.

The process of endocytosis is important for regulating cell signaling. Upon activation by the ligand, receptors are internalized into vesicles and sorted for recycling or targeted to the lysosome for degradation. The process of sorting involves recruitment of specific Rab proteins onto the vesicles. These proteins, which belong to the family of small GTPase, play an important role in directing intracellular membrane traffic. Using P-element excision, we have generated a mutation in the *Drosophila* ortholog of Mon1, which, in yeast, is known to be essential for vesicle fusion with the vacuole through its interaction with Rab7. We have mapped the mutation through extensive molecular and genetic analyses. We have analyzed homozygous mutant embryos for glial and axon guidance defects using immunohistochemistry. Interestingly, these mutants show disorganization of the glial lattice (Figure 7). These findings suggest a role for dMon1 in glial organization.

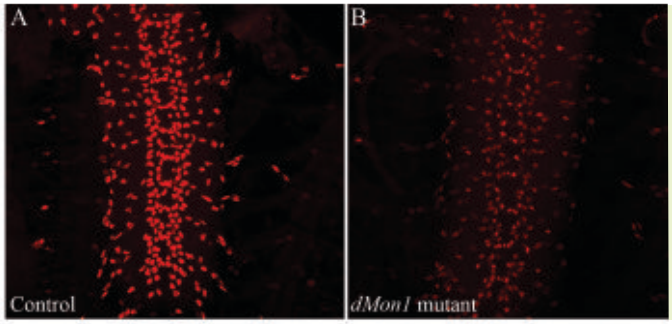


Figure 7 *dMon1* mutants show defects in glial organization

(A) Wild type *Drosophila* embryo stained with anti-repo antibody which marks glial nuclei. Glia are organised around the midline. (B) *dMon1* mutants show disorganized glial lattice

Human Nutrition in Health and Disease

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

Non-communicable diseases

We explored the effects of nutritional deficiencies of macronutrients such as protein and calcium; vitamins and minerals during pregnancy on the fetal outcome of adult disease using both animal models and a community based approach.

Maternal calcium in non-communicable disease risks

Females respond better than males	The effect of maternal supplementation of calcium on body composition of the offsprings revealed that maternal calcium supplementation significantly reduces body fat in female rat pups

The effect of maternal supplementation of calcium (as calcium carbonate and as dairy calcium) on body composition of the offsprings at age 90 days was studied. Whole body composition measurements of the offsprings born to the dams fed on three experimental diet groups viz. Group I (on basal diet providing AIN93 diet with 0.4%, suboptimal calcium), Group II providing high-ca (1.2% ca from Calcium Carbonate), and Group III providing high-Ca (1.2% Ca from non-fat dairy milk i.e. milk powder) were carried out using DEXA analysis. The body composition data showed that compared to basal diet, both the high calcium group showed reduction in the body fat both in male and female offsprings. However, the reduction in median percent body fat compared with basal group due to dairy calcium was significant ($p<0.05$) in both the sexes. The reduction due to dairy calcium was more pronounced in female pups (68.4%) than in male pups (34.6%). The detailed studies to understand the mechanism of this reduction in body fat of pups due to supplementation of dairy calcium to mothers during pregnancy are essential.

Developing community based approach for prevention of anemia

Iron out the deficiency	The study brings out the evidence for impact of social interventions in improving nutritional knowledge and awareness among rural adolescent girls for prevention of anemia

The project focuses on educating adolescent girls about anemia which have several advantages. The data were collected from 16 centers across the country using common methodology for data collection and analysis throughout the study. The baseline data for 2236 rural adolescent girls between ages 10-18 years were collected. The study demonstrated a significant increase in knowledge level, improvement in attitude and increased acceptance of desirable practices about healthy dietary habits which resulted in increased consumption of GLVs

and other iron rich foods and thereby marked improvement in hemoglobin level as well as overall nutritional status, in experimental group compared to control group. This study thus brings out the evidence for impact of social interventions in improving nutritional knowledge and awareness among rural adolescent girls for prevention of anemia which is a major public health problem.

New bio-molecules for nutraceutical/ pharmacological use

Biomolecules	The pharmacological potential of naturally occurring molecules have given encouraging results in treating non-communicable disorders

The pharmacological potential of naturally occurring molecules and their derivatives as antioxidants more specially, against oxidative stress in non-communicable disorders is being explored under this programme. Our project explores the oral hypoglycemic agents from *Costus igneus* and other plants known in traditional systems of medicine. Similarly, naturally occurring molecules are being explored against the oxidative stress in Alzheimer's disease. The bioactive molecules with antioxidant properties as well as copper chelating ability are found to be more effective treatment for Alzhiemer's disease.

Oral hypoglycemic proteins from *Costus igneous* (koenig)

Why inject insulin when you can chew it?	Insulin-like protein isolated from insulin plant holds promise in developing oral supplement for treatment of diabetes

The plant *Costus igneus (C. pictus)*,family Costaceae, popularly known as insulin plant is cultivated in the coastal area of the Uttar Kannada district of Karnataka. In this area, people take traditionally few leaves of this plant twice a day for the management of diabetes. Since 1922, the plant is being explored for the insulin like proteins. In this study, the insulin like protein has been purified from fresh leaves of *Costus igneus.* Authentic samples of leaves of *Costus igneus* were collected from the nursery of Pune University. The insulin like activity of the purified protein was checked in insulin responsive RIN5f cell line in *in vitro* bioassay.

The comparison was made between delivery of protein by oral and injectable route. The purified protein was found to be more effective in reducing blood glucose level compared to IP injection indicating the possible use of the protein in developing oral supplement for treatment of diabetes.

Bioactive molecules for treatment of Alzheimer's disease

Alzheimer's	Gymnemic acid from a plant extract has shown protective properties and increased cell viability. Its role in treating Alzheimer's disease is being explored

Oxidative stress induced by reactive oxygen species (ROS) has been hypothesized to be a principal contributor in Alzheimer's disease (AD). The redox active metal ions iron and copper are found in AD plaques containing the amyloid-β(Aβ) peptide, suggesting that they might mediate ROS generation. We therefore, explore naturally occurring antioxidant molecules for the treatment of AD.

The stem of *Gymnema sylvestre* was collected and extracted for isolating gymnemic acid (GA). Results of an *in vitro* assay using SH SY5Y neuroblastoma cell line indicate that GA shows protection against copper induced cytotoxicity of Aβ peptide in concentration dependent manner. These results suggest that the presence of GA increases cell viability which can be attributed to its antioxidant property. The detailed mechanism of this protective effect of GA is being explored.

Role of micronutrients in metabolic disorders

Trace elements such as copper, zinc and iron are cofactors for many enzymes involved in myriad of bioprocesses. These trace elements are required in optimum concentration and their deficiency as well as their excess may lead to disease-like conditions. Our programme focuses on the metabolism of these trace metals and the related pathologies.

Role of copper in Alzheimer's disease

Alzheimer's disease (AD) is the most common neurodegenerative disease, directly affecting 10% of humans by age 65 and around 50% by age 85. AD is characterized by a progressive cognitive decline that has been attributed to the deposition of extracellular protein plaques containing the amyloid-β (Aβ) peptide. Copper is implicated in the *in vitro* formation and toxicity of AD disease amyloid plaques containing the amyloid (Aβ) peptide. Oxidative stress induced by reactive oxygen species (ROS) has been hypothesized to be a principal contributor in AD. The redox active metal ions iron and copper are found in AD plaques, suggesting that they might mediate ROS generation. Present results authenticate our earlier assay results, asserting the involvement of only one His residue of Aβ1-16 peptide in Cu^{2+} binding.

Hepcidin - A possible indicator for assessing iron status

Data of standard 8-10 girls (n = 47) of a school catering to lower socio-economic class were collected. Subjects were assessed for nutritional status through several anthropometric measurements like weight, height, body fat percent and blood pressure levels. Subjects were also assessed for their habitual dietary intake using a food frequency questionnaire. Blood was analyzed for various biochemical parameters like Hemoglobin, serum iron, hepcidin, Total Iron Binding Capacity and ferritin along with inflammatory markers like TNFα and IL-6. The overall prevalence of overweight (using IOTF cut-off) and under nutrition (Z score for weight < -2) was 29.8 % and 8.5 % respectively.

Microbial Processes

Development of microbial system for treatment of oil field produced water to make it suitable for reinjection into the oil reservoir

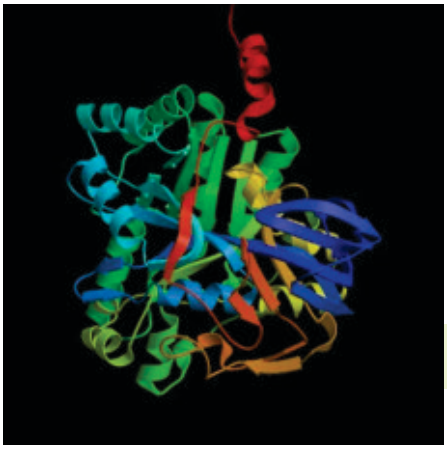
Pollution control in oil industry	Produced water in the oil industry needs to be treated before disposal. A microbial process capable of degrading the total petroleum hydrocarbon in the produced water has been developed

Produced water is a term used in oil industry to describe water produced along with the oil and gas. This by-product of oil exploration requires proper treatment before disposal. Although the physical and chemical methods for produced water treatment are efficient in removal of suspended solids and oil and grease content, these methods do not have a high efficiency level for eliminating dissolved pollutants, especially petroleum hydrocarbons. Hence, the main objective of this project is to develop the microbial process capable of degrading crude oil present in produced water to make it suitable for reinjection into the oil reservoir.

103 isolates were obtained from five produced water and five oil contaminated soil samples. These isolates could be grouped according to the optimum temperature, pH and salinity.

Molecular taxonomic characterization of isolates showed that out of 103 ioslates, 54 isolates are novel, as determined by partial sequencing of 16s rRNA gene. Three different consortia capable of degrading total petroleum hydrocarbon (TPH), showing significant % TPH reduction were developed. Optimization of eco-physiological and nutritional parameters showed an improved % TPH reduction at 37°C, pH 6.5 and supplementation of 1% KNO_3 and molasses and 0.8% crude oil, when enriched consortium was used as inoculum.

Purification and characterization of recombinant hydantoinase for the production of optically pure carbamoyl amino acids



Optically pure amino acids and intermediates find application in a variety of industries such as feed, food, cosmetic, pharmaceutical etc. Hydantoinase enzyme is a hydrolytic enzyme belonging to E.C class 3.5.2.2 and offers several advantages for the synthesis of optically pure amino acid intermediates from hydantoin substrates. Over-expression of hydantoinase (Figure 8) from *P. aeruginosa* HHP01 into *E. coli* was undertaken.

Figure 8 3D homology model of recombinant hydantoinase

The recombinant hydantoinase protein was purified to more than 95% purity with 35.5 fold purification. The thermostability, enantioselectivity, broad substrate profile, tolerance to organic solvents, high catalytic efficiency makes this enzyme a suitable candidate for the synthesis of optically pure amino acids.

Exploration of pristine environments for thermophilic anaerobes and industrially important enzymes

Inulinase can be effectively used for the production of fuel ethanol and ultra-high fructose syrup from inulin. We have described the inulinase activity from a new bacterial strain isolated from mud volcano of Andaman islands and identified as *Bacillus licheniformis.*

The highest inulinase production was observed when sucrose/ starch or inulin was used as carbon source. The highest inulinase yield of 5000 U/L was observed under optimized conditions. Thus the high yielding *Bacillus* strain could be an ideal candidate for the production of inulinase for industrial use.

Eliminating PCR bias to construct unequivocal account of microbial communities using PCR based DNA fingerprinting techniques

The most accurate account of the microbial diversity can be obtained using PCR based DNA fingerprinting techniques. However, this approach has a few associated drawbacks which include PCR bias, PCR inhibitions, inaccessibility of the template DNA etc. Hence, the present investigation was undertaken to design a protocol or methodology that would evenly amplify the range of template DNA without any bias or inhibitions.

The template DNA isolated from environmental sources is usually contaminated with PCR inhibitors such as humic acid, melanin, hematin etc. These inhibitors were eliminated using either commercially available resins or with the help of PCR additives that could effectively immobilize these contaminants during PCR amplifications. Another reason for PCR bias is non-amplification of the templates because of the secondary structure formation. Instability or reduced half-life of the polymerase enzyme is a frequent encountered problem especially when organic solvents are used as PCR additives. The structural integrity of the polymerase enzyme was improved in the presence of organic solvents by stabilizers such as BSA. It was concluded that enhancers have specific role in microbial diversity study.

Molecular investigation and cultivation of microbial diversity associated with methane hydrates with special emphasis on energetics of methanogenesis

Methane hydrates	Investigation of microbial diversity associated with deep sea sediments and methane hydrate deposits in Krishna-Godavari basin and Andaman Sea has been undertaken

Large reserves of methane hydrates have been located in Krishna-Godavari basin and Andaman Sea. It has been postulated that these reserves are almost 200 times bigger than the oil reserves of the entire country. To understand the formation of methane hydrates, it is important to understand the kinetics of methanogenesis in deep subsea floor sediments. In the present investigation the microbial diversity associated with deep sea sediments and methane hydrate deposits was investigated using culture dependent and culture independent approaches. Majority of the bacterial isolates were able to utilize multiple complex carbon sources, whereas methanogens were able to utilize H_2CO_2, acetate, formate and methyl amine as substrates for methane production. Kinetics of methanogenesis from complex carbon sources using consortium of bacteria and methanogens are being carried out to understand the rate of methane formation and prediction of methane yield.

Biotechnological Potential of Microorganisms

Biological hydrogen production

We are studying biohydrogen production through dark fermentation by anaerobic bacteria using distillery waste. The culture *Clostridium* sp. MCM B-509, which we isolated and characterized, produced more biohydrogen (3.35moles/mole of glucose utilized) over type strain *Clostridium acetobutylicum* CCUG 42182 (2.12 moles/mole of glucose utilized). Considering the novelty and high biohydrogen producing activity the whole genome of *Clostridium* sp. MCM B-509 was sequenced in collaboration with MCC-NCCS, Pune. It also provided hydrogenase gene sequence as well as a link to derive pathway for hydrogen metabolism. The optimization studies conducted inMES buffered PYG medium showed C:N ratio of 1:0.5 as the optimum.

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

A total of 235 anaerobic bacterial isolates were obtained from various eco-niches and screened for butyric acid and butanol production from glucose. All isolates produced butyric acid while 57 showed butanol production. Through secondary screening 5 isolates each of mesophilic and thermophilic type were shortlisted for further experiments on butyric acid production. Such screening led to selection of 2 mesophilic and 3 thermophilic isolates for butanol production. Amongst all the isolates, the isolate CHTa produced highest butanol (0.23 g butanol/ g glucose utilized). This yield is higher than that reported for the strain *C. acetobutylicum* JB200 (0.21 g/g glucose utilized). Out of 89 isolates obtained on starch, 40 isolates showed n-butanol production from starch. After primary screening, 11 isolates were selected further for secondary screening. Results of secondary screening indicated that isolate CHTa was the most promising culture amongst the 11 isolates studied for butanol production from starch. The results also suggested that thermophilic isolates are weak in butanol production as compared to the mesophilic ones. Secondary screening for butyrate production from glucose is in progress.

Pharmacological aspects of 'Actinokinase'

A fibrinolytic enzyme, termed as 'Actinokinase', isolated and purified from thermophilic *Streptomyces sp.* has earlier been reported by us. It is well documented that most thrombolytic agents have bleeding complications during therapeutic application. To reduce bleeding complications it is necessary that fibrinolytic enzyme has a minimum clotting time. With a view to determine clotting time for Actinokinase *in vitro* experiments were carried out. As this enzyme is plasminogen independent and fibrin specific in nature, the bleeding complications are ruled out during *in vitro* tests. It is also necessary to perform the clotting time at *in vivo* model. The fibrinolytic enzyme is also used for the *in vitro* clotting time assay along with heparin. Since the enzyme Actinokinase showed activity on urokinase type of substrate it is urokinase type enzyme. Further analysis of the enzyme is in progress and the preclinical animal trials are needed for *in vivo* studies.

Microbial processes/ biotechnological processes of extremophiles

Development of blends and composites based on biodegradable polymer of microbial origin

Halomonas campisalis produces polyhydroxyalkanoates (PHA) from sugars like maltose, sucrose etc. The aim of this work is to make the process economical by using cheap substrates like sugarcane juice. *H. campisalis* was able to produce PHA 35.96 % on dry cell weight basis at pH 7.0.

To increase the PHA production by *H. campisalis* cell recycle approach was used at flask level. The results obtained suggest recycling of cells after 6 hours resulted in increased cell mass and PHA yield by 3.04 and 5.75 fold, respectively.

PHA of microbial origin was blended with optim in different ratios and studied for biodegradability. Blending of PHA with optim resulted in decrease in biodegradability of the PHA polymer.

Health and Nutrition

Resistant starch enriched prebiotic supplement for inflammatory bowel disorders

Prebiotics and resistant starches (RS) are hydrolysed by intestinal microflora. The formations of volatile fatty acids produced in this process have anti-inflammatory properties and could lead to treatment of inflammatory bowel disease (IBD). Data of probiotic growth of retrograded samples (as whole carbon source) expressed as % growth of fructooligosaccharide revealed that coded plant materials M1, P1 and C1 showed promising values of 250, 125 and 110%, respectively. It was also observed that the treatment of soaking in water at different solid:water ratios prior to retrogradation significantly affected the values of resistant starch.

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 (ZON): Studies on mechanism of action

For those with a sweet tooth	In diabetes a reactive oxygen species (ROS) is formed. ROS is a toxic product. Zinc oxide nanoparticles (ZON) synthesised in our lab have shown the ability to detoxify ROS

Investigations on effects of zinc oxide nanoparticles (ZON) on metabolic regulators, oxidative stress and beta cell mass are being carried out. For oxidative stress evaluation, human hepatoma cell line (HepG2) was chosen, as the liver is the major site of absorption and excretion of drugs. Results on *in vitro* cytotoxicity indicated that ZON at 1-30 µg/ ml concentration was non-cytotoxic, but 100 µg/ ml caused cytotoxicity and cells underwent apoptosis as evidenced by the TUNEL assay. Contrary to our expectations, ZON treatment (3 and 10 µg/ml) had no significant effects on SOD activity. However, an increase in catalase activity was observed after ZON treatment indicating detoxification of hydrogen peroxide (H_2O_2), a reactive oxygen species (ROS), which is a toxic product of both normal aerobic metabolism and pathogenic ROS production, as is the case in diabetes. Simultaneously increased levels of reduced glutathione (GSH) were also observed. To summarize, ZON treatment enhanced detoxification and protected against oxidative stress. The protective effects of ZON treatment on H_2O_2 induced oxidative stress will now be undertaken.

Fluorescent carbon nanospheres for nuclear delivery

Bull's eye	Nanomedicine aims at targeted drug delivery. In the context of treatment of cancers it is desirable that the drug should reach the nucleus of the cancer cell and interact with the DNA. Carbon nanospheres which attach to the nuclei of cancerous cells were synthesised. These can act as drug delivery agents ensuring the delivery of the drug to the cancerous cells

We have synthesized carbon nanospheres (CNS, size ~250 nm and negative surface charge) containing graphitic carbon and which exhibit aldehyde and hydroxyl groups on their surface. These particles show a strong absorption in UV range with absorption maxima at 282 nm and an emission in visible range (green color). *In vitro* studies indicated that they were internalized by cells and got localized in the nucleus of the cells. Thus, these particles could, in principle, be used as a nuclear delivery agent. Further these particles were electrostatically conjugated with the DNA binding domain of SMAR1 (Scaffold Matrix Attachment Region binding protein 1; a protein which causes cell cycle arrest) i.e. His 5 and allowed to interact with MCF7 cells (breast cancer cell line).

During this, levels of cyclin D1 were also monitored. MCF7 cells treated with CNS His 5 conjugate indeed showed cell cycle arrest and reduced levels of Cyclin D1 after 24 h treatment. However, whether apoptosis can also be achieved, warrants further investigation.

Catalytically inactivated and structurally intact enzymes as novel biorecognition elements

Tatkaal seva	A method to rapidly diagnose urinary tract infections, dermatophytic mycoses; monitor clarification of fruit juices in food industry, detect adulteration in milk was developed. The method exhibits a fantastic potential

The utility of catalytically inactive enzymes as biorecognition elements for various applications specifically with reference to the non-destructive sensing of substrates was explored.

The interactions of inactivated enzymes and their substrates were monitored based on the principles of immunofiltration assay. It was possible to demonstrate the detection of pure chitin upon its interaction with inactivated chitinase. The simple assay was then tested for differentiating yeasts and bacterial cells, where pink spots were visualized with *Candida* sp. and no color developed with *Staphylococcus aureus* cells. The assay can be used to rapidly diagnose urinary tract infections, dermatophytic mycoses etc., where yeasts and bacteria if differentiated rapidly, can be treated more effectively.

Similarly, the rapid detection of pectin using inactivated pectinase was possible. This is useful to monitor clarification of fruit juices in food industry. Apart from these examples we describe co-factor removal as a means to achieve inactivation of DNaseI and urease for recognition of double stranded DNA (with possible applications in diagnostics) and detection of urea, which is used as an adulterant in milk. Since the method of detection is rapid, this could be an alternative to conventional methods. Thus, the work has defined a new molecular recognition element viz., an inactive form of an enzyme, and could in principle work for many more applications.

Nano-diagnostics

DNA*RAP*: A rapid method for isolation of DNA

Only 10 minutes, please	DNA*RAP* – a rapid and inexpensive method of DNA isolation has been developed. It has wide applications in diagnostics, forensics and molecular biology. The test takes only ten minutes

Research and development in molecular biology is dependent on isolation of DNA in pure form. Most current methods of DNA separation are relatively time-consuming and require the use of adsorbents, toxic substances, nucleases, and/or filtration media to separate DNA. We have developed a simple, rapid and inexpensive method of DNA isolation, DNA*RAP*.

DNA*RAP* involves the use of surface modified magnetic nanoparticles which isolate and purify DNA in one step. The nanoparticles physically disrupt the cells thus surpassing the need of harsh cell lysis reagents. These magnetic nanoparticles due to their surface modification possess affinity towards DNA resulting in specific adsorption of DNA on nanoparticles surface. Since the nanoparticles are magnetic in nature they can be easily separated physically by using a magnet. The entire process can be completed within 10 minutes. Purified DNA thus obtained can be used for downstream applications such as PCR amplification. The method can have wide applications in diagnostics, forensics and molecular biology. DNA from bacterial, viral and cultured animal cells can be obtained using this method.

Lanthanum Strontium Manganese Oxide nanoparticles: a new theranostic agent

New theranostic agent for cancer therapy	Non-cytotoxic, non-hemolytic nanoparticles have been developed that show suppression of tumor cells. This is the first report on the utility of nanoparticles as a new theranostic agent for cancer therapy by hyperthermia and as a negative MRI contrast agent

Our earlier experiments have identified Dextran coated Lanthanum Strontium Manganese Oxide nanoparticles (Dex-LSMO NPs) as a new targeted hyperthermia agent for treatment of cancer. The toxicity of Dex-LSMO NPs both *in vitro* and *in vivo* systems has proved that nanoparticles are non-cytotoxic, non-hemolytic and safe up to dose of 50 mg kg^{-1} when injected intra-venously and intra-peritoneally in C57/BL6 mice. Subsequently it was possible to demonstrate tumor regression *in vivo* using nanoparticles that were injected intra-tumorally. Tissue distribution study showed that Dex-LSMO NPs could lodge into the liver within 2 h of intra-venous administration without any abnormal architectural changes. To prove its possible utility as a contrast agent in MRI, (a) measurement of T1 and T2 relaxation times at various concentrations of Dex-LSMO NPs was carried out and (b) signal changes due to accumulation of the NPs in tumors generated in mice were monitored. The r1 and r2 relaxivity values of Dex-LSMO NPs are found to be 6.741 s^{-1} mg^{-1} mL and 778 s^{-1} mg^{-1} mL, respectively which were comparable to commercially available contrast agents. To the best of our knowledge this is the first report on the utility of Dex-LSMO NPs as a negative MRI contrast agent. The studies also prove the utility of Dex-LSMO NPs as a new theranostic agent for cancer therapy by hyperthermia and as a negative contrast agent in MRI.

Agricultural nanotechnology

Development of environmentally benign nanomaterial-based enzyme formulations for biocontrol of plant pathogens and pests

Biocontrol	Eco-friendly enzyme formulations have been developed to minimize the use of chemical pesticides, application volume and specific targeting of the pest or pathogen. These formulations hold a promise in safeguarding the environment

This eco-friendly method aims to minimize the use of chemical pesticides. Negatively charged polymer nanoparticles such as chitosan alginate nanoparticles (ACNPs) were synthesised for differential binding of enzymes from *Myrothecium verrucaria* enzyme complex. Chitosan nanoparticles (CNP, 350nm, +34mV) and alginate chitosan hybrid nanoparticles (400nm, -29mV) were characterized by TEM and Zeta sizer. This approach would allow the differential binding of enzymes on the nanoparticles. Lipase showed higher binding with CNPs while endochitinase was bound to ACNPs. These enzymes were released in a slow controlled manner by the nanoparticles. Bioassay against *Fusarium* showed effective control by ACNPs-enzyme preparation as compared to the bare enzyme that could be attributed to the higher immobilization of endochitinase and its slow release. In case of insect pest, *Maconellicoccus hirsutus* (pink mealy bug), the CNPs-enzyme preparation showed effective control. The mixture of such differentially bound enzymes would help achieve specific targeting of the pest or pathogen.

Enhancing use efficiency of micronutrients: Novel delivery systems

Nano-carrier, micro-nutrient, macro-yield	Nanoparticulate carriers for compensating micronutrient deficiencies, particularly zinc, show promise as alternative to conventional formulations of micronutrients. Success is indicated by a higher grain zinc content and grain yield

Widespread deficiencies of zinc (Zn) and boron (B) have been observed in India, and soils in Maharashtra are particularly zinc deficient. Agronomic biofortification using foliar spray can in principle, be used effectively to overcome the problem of micronutrients deficiency in subsoil. As an alternative to conventional formulations of micronutrients, use of nanoparticulate micronutrient carriers is proposed aiming at slow and sustained release of micronutrients, which can be extrapolated to field application of macro- and other agrochemicals.

Two formulations containing Zn loaded chitosan nanoparticles (4, 40 mg/L Zn, Nano1 and Nano 2) suitable for foliar application were prepared and tested in pot and field scale experiments using two wheat varieties (viz., MACS-3125, developed at ARI and Hgpc-1, that carried a gene for high grain protein content). For comparison conventional formulations containing urea, urea and $ZnSO_4$ were included in the experiment. All treatments showed enhancement in grain Zn content. As expected, treatment with Urea (0.2%) + $ZnSO_4$ (Zn, 400 mg/L) was best among all treatments. Both the nanoformulations also showed an increase in grain Zn content in comparison with that of control, albeit at 10-fold lower concentrations. Apart from Zn, marginal mobilization of iron in grains was observed for Hgpc-1 variety. The data of the field experiment show that higher zinc content in grain could be achieved without reducing the thousand grain weight and thus indirectly the grain yield. The high yield characteristic of MACS 3125 was not comprised due to foliar application. The novel carriers for micronutrient show promising results which necessitates further confirmation.

Nanomaterials treatment to seeds for enhancing germination efficiency in medicinal trees

There is a need to develop newer and better methods for enhancing seed germination efficiency. Treatment of seeds with appropriate nanomaterials could enhance their germination efficiency. As part of the project, utility of nanomaterials (viz., carbon nanotubes, iron oxide nanoparticles, Lanthanum Strontium Manganese Oxide (LSMO) nanoparticles, TiO_2, ZnO) and hydrogels in breaking seed dormancy and enhancement in germination efficiency especially in medicinally important tree species is being studied.

Magnetic nanomaterials (iron oxide and Lanthanum Strontium Manganese Oxide) that show heating under applied radiofrequency (RF, 365kHz) enhanced germination efficiency in all seed species tested [viz., *Aegle marmelos* (L.) Corr. (Intermediate seed type), *Mimusops elengi* L. (Orthodox/Intermediate seed type), *Oroxylum indicum* (L.) Vent. (Orthodox seed type)] (Figure 9, 10). As expected seeds showed variations with respect to occurrence of germ tube. Exposure to magnetic nanoparticles for 18 h and to radiofrequency (RF) which caused heating of nanoparticles for up to 20 minutes had no adverse effects on germination. In fact, seeds exposed to nanoparticles and heated under radiofrequency showed earlier germination (8-15 days) in comparison to those soaked in distilled water (13-20 days). Seedling survival rate was 100% in seeds treated with iron oxide nanoparticles and heated for up to 20 minutes under RF while in other treatments it ranged from 66 – 100%. Seeds germinating in soil mixture showed good seedling growth but germination rate was faster on wet germination paper. Root-shoot length showed encouraging results compared to control.

Figure 9 *Aegle marmelos* seedlings transferred in cup after 15 days

Figure 10 *Aegle marmelos* seedlings transferred in pots after seven months

Natural Product Chemistry

Work in this area is contributed by the Botany, Chemistry and Mycology groups.

Standardization of medicinal plantextracts

High standards needed	Development of quality standards library with reference to Phytochemical Reference Standards (PRS) for traditional herbs is necessitated.TwoPRS have been standardized

Development of HPTLC profile library of phytochemical reference standards

This project aims to develop phytochemical reference standards (PRS) library by HPTLC profiling for selected Indian medicinal plants. PRS Conessine has been standardized from various “Kuda” samples. Three botanically different species were documented under crude drug “Kuda” complex. Other PRS Lupeol has been standardized from botanically different “Savar” crude drug complex.

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

Commercial brands, local made v/s laboratory made	Branded and locally made fruit and vegetable juices were compared for their quality with laboratory made juices. Laboratory made juices were better than commercial brands

Consuming fruit and vegetable juices for medicinal as well as health promoting actions is practiced for stress management by modern civilians. Majority of these juices are not standardized physico-chemically and their antioxidant status is also doubtful. Considering this, the project work was planned for comparative study of commercially available brands, local made juices along with the authentic juice sample prepared in laboratory to record physicochemical and antioxidant potential. Various samples of jamun juices (*Syzygium cumini*) were studied.

In physico-chemical analysis authentic juice sample showed higher content of vitamin C and polyphenols and moderate amount of flavoniods as compared to street side and ready to drink jamun juice samples. Authentic juice showed better antioxidant status followed by ready to drink juice and least activity was observed from local made juices.

Phytochemistry

Quality is the key	Properties of medicinal plants are known to vary as per their habitats. Quality standards are essential to standardize herbal medicines. Quality standards were developed for eight medicinal plants

Development of quality standards of Indian medicinal plants

The work on developing monographs of Quality Standards of Indian Medicinal plants led to the preparation of monographs on eight medicinal plants. The marker compounds were isolated from the respective plants. TLC and HPLC profiles of the crude plant extracts with reference to the marker compounds were developed.

Semiochemicals

Honey and crop production	Repelling the honeybees from pesticides intended for other pests and attracting the honeybees for pollination benefits both the honey industry and crop production. Success was achieved in both

Development of attractant/repellent formulations for honeybees

Search for novel plant based attractant/repellent formulations for honeybees was continued under this programme. Screening of 1,8-cineole, the major constituent of the essential oil from *Amomum aromaticum* seeds for attractant/ repellent properties towards honeybees, *Apis florea*, was completed. Results indicate dose dependent repellent property at lower concentrations and attractant properties at higher concentrations.

The final field trials of honeybee attractants on niger, Bunny BG-I and Bunny BG-II were completed at UAS, Dharwad. It was demonstrated that efficiency of pollination increased due to the application of attractant formulations.

Development of attractant and repellent formulations for mealy bug *Maconellicoccus hirsutus*

To develop attractant/repellent formulations for pink mealy bug *Maconellicoccus hirsutus*, the screening of whole body extract of the crawlers was carried out. The attractant property of the extract was observed. Study of formulations of various concentrations is being done.

Anti-inflammatory activity of propolis from Maharashtra

Beehive to the rescue	Propolis is a beehive product used in folk medicine. Our findings proved that beehive propolis showed significant topical anti-inflammatory activity compared to standard drug

Propolis is a beehive product used in folk medicine.However, its composition and properties vary widely. Anti-inflammatory activity of Indian propolis is not much explored. Present studies are carried out on propolis collected from Mahabaleshwar, Maharashtra. The total ethanolic extract, all the fractions and volatile oil of propolis examined show significant topical anti-inflammatory activity. Ethyl acetate soluble fraction (EAFP) is found to be the most active fraction. Systemic study of EAFP showed that the dose of 200 mg/kg showed more reduction in inflammation at 4 h than that due to the standard Indomethacin at the concentration of 10 mg/kg.

Environment-friendly synthesis of biomolecules

Reduction of ethyl-2-methyl-3-oxopentanoate to obtain ethyl 2-methyl-3-hydroxypentanoate was carried out in presence of carbonyl reductase enzyme isolated from *Geotrichum candidum.* The reaction product showed single spot on TLC.

Bioprospecting of fungal pigment

Skin care	Fungal melanin is reported to protect organism against ionizing radiations. We achieved maximum melanin production from *Gliocephalotrichum bulbilium*

UV-absorbing properties of melanin have tremendous biotechnological potential in skin care formulations, optics and plastics.Hence, work on melanin production from fungi was undertaken.

During the statistical optimization of melanin production *Gliocephalotrichum bulbilium* (NFCCI 1898) produced maximum melanin compared to other selected strains and was selected for scale-up at 30 L. Black coloured melanin was produced, which was harvested by filtration. The purified melanin was biochemically characterized and its fourier transform infrared (FTIR) spectroscopy was done.The nature of melanin (as eumelanin) derived from tyrosine and dihydroxyphenylalanine (DOPA) was confirmed by growing cultures in presence of various concentrations of kojic acid. It was concluded that eumelanin formation from DOPA is inhibited by kojic acid.

Lichens

Growth promoting effects of some lichen's natural secondary metabolites on probiotic bacteria

Extracts of four natural lichen species *Canoparmelia eruptens*, *Everniastrum cirrhatum*, *Parmotrema austrosinense* and *Rimelia cetrata* were studied for the source of natural antioxidant and their purified secondary metabolites were evaluated for growth promoting effects on probiotic bacteria *Lactobacillus casei*. The methanolic fraction of lichen species showed moderate to high antioxidant activity in the order *P. austrosinense* >*E. cirrhatum* >*C. eruptens* >*R. cetrata.* Growth promoting effects of lichen metabolite lecanoric acid at 100 µg/ml on *L. casei* showed high growth stimulating activity in terms of increased dry matter of biomass (56.08 mg). At lower pH the growth promoting activity of lichen metabolites was found stable.

Palaeobiology and Palaeontology

Ichnology

Burrows tell the history of ancient sea level rise and fall

Ichnological studies have led to reporting for the first time eight forms from the Jaisalmer Formation, sixteen ichnospecies from the Bada Bagh Member

Mesozoic – Jaisalmer Formation, Rajasthan

Figure 11 *Arenicolites*

Ichnological studies of the Jaisalmer Formation have resulted in the identification of 42 ichnospecies. Of these, eight forms were reported for the first time from this basin. The lowermost portion of Hamira Member is devoid of trace fossils; while the middle part of the sequence shows abundance of domichnial burrows (Figure 11).

The Joyan Member shows poor development of ichnofauna. Only six ichnospecies are present within this member and the assemblages are monospecific. Eight ichnospecies are recorded from the Fort Member. Ichnogenera belong to two ethological classes, viz. domichnia and fodinichnia.

Commencement of Bada Bagh Member is evinced by an intrabasinal conglomerate at the base (Figure 12). Diverse and abundant ichnofauna comprising sixteen ichnospecies were recorded mainly from the calcarenite and marls.

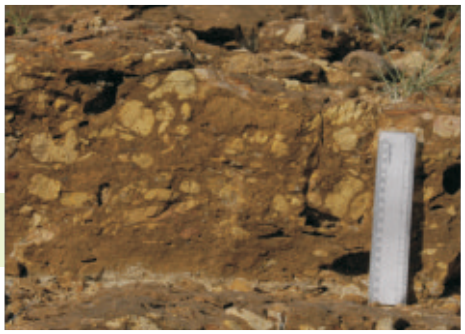


Figure 12 Presence of hardground indicated by occurrence of borers in the basal part of Bada Bagh Member

Fifteen ichnospecies are recorded from the carbonate dominated Kuldhar Member. Culmination of the Kuldhar Member is manifested by the development of a hardground as evinced by abundant borings belonging to ichnogenus *Gastrochaenolites* (Figure 13).The ichnofauna and associated primary sedimentary features suggest that the entire Jaisalmer Formation was deposited under upper shelf conditions.

Figure 13 *Gastrochaenolites*

Cauvery Basin, Tamil Nadu

Observations, measurement and sample collection of Karai Formation, Utatur Group were undertaken at three traverses. A distinct vertical change in ichnofauna was noted in the traverse encompassing the maximum thickness of this Formation.

Carbonate and arenaceous samples from the entire section of Dalmiapuram Formation, Utatur Group at Dalmia Cement Ltd.'s Kovandankurichchi quarry were analysed for petrographic investigations and the marl samples were processed for their foraminiferal content. 31 species of foraminifera were identified.

Quaternary

Precipitating a crisis?	Evidence suggests that the entire terrain west of Sahyadri (Western Ghats) was thickly forested and received 2-3 times more than the present

Vegetation response and landscape dynamics to Holocene climate change in Southwestern India: eco-geomorphological appraisal of sub-fossil logs

The wetlands and riverine sediments of the Kerala coast in southwestern India contain abundance of buried tree trunks of the past forest vegetation and these subfossil logs constitute important proxy for palaeoclimate and ecogeomorphological appraisal hitherto reported from Indian subcontinent and complement the available palynological data. All the fossil wood and subfossil logs retrieved, though not sufficient for generalization, have yielded ages prior to the Holocene transgression (7.0 - 6.5 k yrs BP) and pieces of evidence suggest that the entire terrain west of Sahyadri (Western Ghats) was thickly forested during the Holocene climatic optimum (9.0 – 6.0 k yrs BP) when the region had witnessed a spell of heavy precipitation, ~ 2-3 times more than the present.

Environmental significance of intertidal mangrove foraminifera of Coastal Maharashtra

Understanding nature	Pollution has hit the Vasishthi estuary hard which now supports barely 6-7 species of fish

Figure 14 Biofouling of mangroves

Continuing with the efforts to document the distribution of foraminifera and their environmental implications, from the intertidal mangroves of Maharashtra, the Vasishthi, a major estuary, was sampled. This estuary, once known to house nearly hundred fish and shell-fish varieties, is now reported to support hardly 6-7 species of fish. Dead fish were seen floating on the surface of the estuarine waters. Water samples analysed for salinity, pH and DO show normal estuarine water quality. However, further analysis of water and sediments should give clues to toxicity in the ecosystem. Another threat to this ecosystem is prolific biofouling of the mangroves (Figure 14).

Samples previously collected from the lower reaches of the Kundalika estuary yielded abundant foraminifera. 84 species of benthic foraminifera belonging to 37 genera have been identified. Uniform distribution of planktonic and rounded benthic foraminiferal forms across the tidal flat indicates uniform tidal influence at all times (i.e. throughout the fortnightly tidal cycles). These signatures suggest that the foraminifera from tidal flats in the lower reaches of the Kundalika estuary are better proxies for changes in the ecosystem rather than sea level changes.

Virology

Bacteriophages

Study of bacteriophages of certain *Salmonella* species

Bacteriophages are very common in all natural environments and are directly related to the numbers of bacteria present and have shaped the evolution of bacteria. In spite of their ubiquity, a vast majority of bacteriophages in the environment have never been studied and not much is known about them.

Protein profiles were obtained for six different phages viz., V277 and V553 (bacteriophage against *S. gallinarum*), V92, V197, V316 (bacteriophage against *S. enteritidis*) and P22. Total four protein bands were observed for bacteriophage V553 (against *S. gallinarum*). For bacteriophage V277 two major and five minor protein bands were obtained. Five protein bands were obtained for bacteriophage P22 (Standard phage against *S. typhimurium*). One protein band from each V277 and V553 corresponds to protein band of P22.

Isolation and characterization of lytic bacteriophages against *E.coli* and *Klebsiella pneumoniae* strains which would also lyse multidrug resistant bacteria: A potential therapeutic agent

seventy different bacterial strains isolated from clinical samples were procured from different hospitals and characterized biochemically. Most of the isolates were resistant to two or more groups of antibiotics. Carbapenem resistance was mostly found in *Escherichia coli, Klebsiella pneumoniae and Pseudomonas aeruginosa*.

Five specimens of bacteriophages have been isolated from a sewage sample by agar overlay method. These bacteriophages were found to be lytic for *E. coli* and *K. pneumoniae.* In host range study, it was indicated that bacteriophage V2058 isolated against *K. pneumoniae* had a narrow host range, and it is highly genus and species specific. This limited host range can be advantageous, in principle, as phage therapy results in less harm to the normal body flora and ecology than commonly used antibiotics, which often disrupt the normal gastrointestinal flora and result in opportunistic secondary infections. It was observed that the V2058 phage isolate was comparatively more thermo-resistant than the standard *E. coli* phages.

Annexure

Repositories

Agharkar Herbarium at MACS (AHMA)

One thousand four hundred 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 and specimen deposited by Ph. D. students. Process was initiated for incorporation of specimens received from RGSTC project. These specimens of medicinal plant species are collected by various collaborators spread across Maharashtra. Forty-five additions were made to AHMA during this year. Presently the total number of specimens in AHMA database is 27,500 along with 1500 herbarium images. The development of image library based on photographs taken in the field tour is also continued. In future it is planned to tag this library with digitized AHMA package.

National Fungal Culture Collection of India (NFCCI)

After verification of taxonomic identity, fungal strains are deposited in NFCCI. As part of conservation of fungal diversity, live, pure and authenticated cultures of 293 interesting fungi were added. The total number of fungal cultures comes to 3030 in NFCCI. The fungal germplasm are being maintained in culture collection by following standard long term preservation methods, like freeze drying, liquid nitrogen, glycerol and distilled water.

Ajrekar Mycological Herbarium (AMH)

124 herbarium specimens were deposited during the year. The total AMH accessions reached 9578 besides 30,000 lichen samples. AMH contains several type materials of many noteworthy species of fungi and lichens reported from 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.

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.

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	26477	Maps and Atlases	562
Reference Books	1090	Microfilms/Fisches	636
PhD Thesis	280	Annual Reports	443
M Sc/M Phil Thesis	96	Journals	177

Services rendered/ offered

Crude Drug Authentication Service

ARI has been carrying out the Authentication Service which deals with the identification, authentication and repository of crude drug samples for academic as well as industrial purposes. Generation of the authentication certificate/report and deposition of the samples in archives or repository as per request of the party has been done. During the report time total 287 authentication reports were generated; out of it, 16 materials were processed for industries. This takes total accessions to 815 specimens.

Fungal Identification Service

A large number of fungal cultures, diseased samples were received from different research institutions, agricultural universities, private organizations and industries. Soil samples received were also analyzed for TVC/CFU and nematode counts. Total 920 fungal cultures received for identification (morphological & molecular) from academic and research and private centres across the country were identified using morphological and /or rDNA sequencing. As such more than 124 centres in India were benefited, which includes 109 different academic and research institutes, and 15 private centres. In addition, 104 different fungal strains were supplied to various academia research and private centres.

Licensing of know-how

Nanomaterials based method for rapid isolation and purification of DNA

Nanomaterials based rapid identification and antibiotic sensitivity testing of uropathogens

Transferred to: Robonik India Pvt Ltd., Mumbai

Patents

Patent	Details	Inventor(s)
A microbial process for production of antifungal compound active against phytopahogenic fungi using a haloalkaliphilic bacterium *Halomonas campisalis*	611/MUM/2012 (Complete specification filed, 24 May 2012)	Kanekar PP, Borgave SB, Naik DG, Kelkar AS
A method for rapid isolation and purification of DNA	481/MUM/2013	Chaudhari MK, Rajwade JM, Paknikar KM

Patent	Details	Inventor(s)
Development of a bioprocess to reduce pathogenic load and malodor of human night soil	2072/MUM/2012	Ranade D R, Dhakephalkar PK, Deshpande MG, Lanjekar VB, Padmanabhan G, Dnyansagar RV
Microbial process for the production of optically pure unnatural carbamoyl amino acids	1384/MUM/2013	Engineer AS, Dhakephalkar PK, Gaikaiwari RP
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

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(Research papers, Monographs, Book chapters, Bulletin, Booklet)

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Majumdar DR and Kanekar PP.2012. Different aspects of production of thermolysin-like protease from *Thermoactinomyces thalpophilus*. International Journal of Pharma and Bio-Sciences, 3(1):B-610 – B627

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Monographs

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Book Chapters

Kanekar PP, Kanekar SP, Kelkar AS and Dhakephalkar PK. 2012.Halophiles-Taxonomy, Diversity, Physiology and Applications. Microorganisms in Environmental Management: Microbes and Environment, Editors T.Satyanarayana *et.al.* Springer Science + Business Media B.V., DOI 10.1007/978-94-007-2229-3_1,pp. 1-34, .

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Papers Presented at Conferences/ Symposia/ Seminars

Chitte RR. Fibrinolytic enzyme from thermophilic *Streptomyces sp.* National Conference on Challenges and Opportunity in Life Sciences, Kolhapur, 8 February 2013

Chitte RR, Kanekar PP, Krishnan L, Kartha RS, BhuvaneshwarGS.Fibrinolytic enzyme 'Actinokinase' – An *in-vitro* evaluation, Current Pharmaceutical Biotechnology.FirstBiotechnology World Congress, Sharajah, 14-15 February 2012

Deshmukh SM, Aurora P, Saraph A, Rajwade JM, Paknikar KM. Constant-pH molecular dynamics simulations reveal the non-destructive substrate sensing ability of hen egg white lysozyme (HEWL) at alkaline pH. International conference on biomolecular forms and functions.A celebration of 50 years of the Ramachandran map. Indian Institute of Science, Bangalore, India, 8-11 January 2013

Kamalaskar LB, Gadre RV, Dhakephalkar PK and Ranade DR.Optimization of growth and media parameters for bio-hydrogen production using *Clostridium* sp. MCM-B-509. World Hydrogen Energy Conference, Toronto, Canada, 3-7 June 2012

Kanekar PP, Kulkarni SO, Nilegaonkar SS, Sarnaik SS, Kshirsagar PR, JogJP.Microbial biodegradable polymer having potential application in packaging.First Indo-US International Conference on Polymers for Packaging Applications, Kottayam, Kerala, March – April 2012

Kshirsagar Prachi. Studies on seed and seedling morphology of some high valued medicinal plants from family Fabaceae. 22nd Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT), Department of Botany, Sant Gadge Baba Amravati University, Amravati, Maharashtra, 28- 30October 2012

Panchang R. High-resolution multi-proxy climatic reconstruction off Myanmar suggestive of climatic modulations due to solar forcing during last 489 years.International Conference PAGES Young Scientists Meet (YSM) and Open Science Meet (OSM), NCAOR, Goa, 10-19 February 2013

Philips Varghese, Oak MD and Taware SP. Soybean breeding – New strategies for future challenges. National seminar, New Frontiers in Plant Science Research for Sustainable Development, Orissa University of Agriculture & Technology, Odisha, 25-26 February 2012

Pore S and Dhakephalkar PK. Characterization of thermophilic inulinase from *Bacillus* sp. isolated from mud volcano. 81st Annual Meeting of the Society of Biological Chemists (India) and Symposium on Chemistry and Biology: Two Weapons Against Diseases. Science City Auditorium Complex, Kolkata, 8-11November 2012

Taware SP, Philips Varghese and Jaybhay SA.Response of some new soybean varieties to date of sowing. 3rd International Agronomy Congress, IARI, New Delhi, 26-30 November 2012

Workshop, Metals in Health and Diseases, ARI, Pune, 8 January 2013

Kulkarni PP. Protective role of L-histidine against copper induced neurotoxicity of Aβ peptide

Apte PP. Prevalence of anemia and hepcidin levels among Indian adolescent girls

Sharma Sona. Effect of maternal calcium deficiency on metabolic syndrome in adult offsprings

Conference, Genomics for Crop Improvement, Institute of Bioinformatics and Applied Biotechnology, Bangalore, 18-20 February 2013

Tamhankar SA, Honrao BK, More MN, Raut AL, Oak MD. Pyramiding multiple rust resistance genes in the background of popular wheat varieties using Marker Assisted Backcross Breeding. Poster

Oak MD, Cholin S, Ladhe P, Ayachit G, Tamhankar SA. Mobilizing QTL/Gene(s) for Quality Traits into High Yielding Bread and Durum Wheat Varieties of Central and Peninsular Zone through MAS. Poster

Philips Varghese, Pritam Jadhav, *Oak MD*. Development of Kunitz Trypsin Inhibitor free Soybean Varieties Using Marker Assisted Backcross Breeding. Poster

IX World Soybean Research Conference, Durban, South Africa, 17-22 February 2013

Taware SP and Philips Varghese. Evaluation of some soybean genotypes for insect-pest resistance

Philips Varghese, Oak MD and Taware SP. Variability in soybean oil quality

XXXVI All India Cell Biology Conference and International Symposium on Stress adaptive response and genome integrity. Bhabha Atomic Research Centre, Mumbai, October 2012

Barve A, Ghaskadbi S and Ghaskadbi S. Conservation of nucleotide excision repair pathway: Characterization of hydra xeroderma pigmentosum group F homolg.

Deoli V, Ghaskadbi S and Ghaskadbi S. UV radiation-induced ectopic foot formation in regenerating hydra is mediated by up regulation of matrix metalloproteinases and inactivation of Wnt pathway.

Ghodke K, Ghaskadbi S and Ghaskadbi S. Antioxidant enzyme defense in diploblastic hydra

Karandikar A, Patwardhan V and Ghaskadbi S. Large scale hydra embryo production and establishment of transgenic hydra facility

Surekha LK and Ghaskadbi S. Study of angiogenesis regulatory genes in hydra: Evolutionary role of VEGF and FGF

International Symposium and XXII Annual Conference of Indian Association for Angiosperm Taxonomy on Innovative Prospects in Angiosperm Taxonomy (ISIPAT-2012), Department of Botany Sant Gadge Baba Amravati University, Amravati, Maharashtra, 28-30 October 2012

Bonde SD, Chate SV and Gamre PG. *Raphiocauon biradarii* gen. et sp. nov., a petiole of *Raphia* (Calamoideae : Arecaceae) from Umaria Intertrappeans, District Dindori, Madhya Pradesh, India

Gamre PG, Bonde SD, Guleria JS and Shukla A. A new species of fossil *Simarouba* from the Deccan Intertrappean beds of Nawargaon, district Wardha, Maharashtra, India

Nipunage DS, Gamre PG and Bonde SD. Occurrence of *Ailanthoxylon indicum* (Prakash) from the Deccan Intertrappean beds of Deori, District Dindori, Madhya Pradesh, India

Punekar SA and Lakshminarasimhan P. Reappraisal of Family Eriocaulaceae in India

XIII International Palynological Congress & IX International Organization of Palaeobotany Conference, Tokyo, Japan, 23-30 August, 2012

Kumaran KPN, Limaye RB and Padmalal D. Holocene vegetation dynamics in southwestern India: palynological and palaeoecological appraisal of terrestrial and marine archives

Limaye Ruta B and Kumaran KPN. 2012. Changing scenario of mangroves in response to climate and sea level changes in Southwestern India since last 10k years

Third Sino-Indian International Conference: Biodiversity and Environmental Changes in the Himalayas and International Conference on Plant Culture and Environment (ICPCE), Xinxiang City, Henan Province, China, 18-24 September 2012

Kumaran KPN and Punekar SA. Disjunct distribution of plant taxa and habitat fragmentation since post Himalayan uplift: an appraisal of plant fossil archives and modern analogues from India

Limaye Ruta B. 2012 Biogeographical and palaeoclimate appraisal of mangrove vegetation in south Asia and Southeast Asia in the post Himalayan uplift scenario

50th International Conference on Industrial Biotechnology & IX Convention of The Biotech Research Society, India & Indo-Italian Workshop on Food Biotechnology: Industrial Processing, Safety & Health, Punjabi University, Patiala, 21-23 November 2012

Deshmukh SM, Aurora P, Saraph A, Rajwade JM and Paknikar KM. Catalytically altered enzymes for molecular biosensing: *In Vitro* and *In Silico* evidence of the concept of using lysozyme as a model.

Pal KA, Choudhari MK, Shahapurkar GV, Rajwade JM and Paknikar KM. Active wound dressing based on chitosan stabilized silver nanoparticles.

Dhakephalkar PK. Exploration of microbial diversity associated with Indian petroleum reservoirs for novel and industrially important microorganisms and enzymes.

Engineer AS and Dhakephalkar PK. Cloning, expression and characterization of a Hydantoinase from Psuedomonad in to *E. coli* for techno commercially feasible production of optically pure amino acids (poster)

Participation in Conferences/ Symposia/ Seminars/ Workshops

Behera BC

Training, Modern Techniques in Bioprospecting Lichens, DBT National Network Program on Lichens. MS Swaminathan Research Foundation, Chennai, 18-21 March 2013

Datar M

Workshop, Botanical Nomenclature Course, Botanical Survey of India, Kolkata, 11-13 January 2013

Deshpande A, Mukherjee P

Training, efficient utilization of wild and exotic wheat germplasm facilitated by molecular markers and doubled haploidy, Punjab Agricultural University (PAU), Ludhiana under Niche Area of Excellence, 8-14 March 2013

Ghaskadbi S

Discussion meeting-cum-workshop, Individuals and Groups, International Center for Theoretical studies, TIFR, Mumbai, Almora, May 2012

Perspectives in Biology: DBS@50, Tata Institute of Fundamental research, Mumbai, August 2012

UGC e-Pathshala Workshop in Zoology, Delhi, November 2012

Satellite meeting on the DST family of institutions, Indian Science Congress, Bose Institute, Kolkata, December 2013

MK Chandrasekharan memorial meeting, Evolutionary and Organismal Biology Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, January 2013

Gurav SS, Panchang R

Workshop- Marine Geosciences Research in India: Current Status and Future Dimensions, National Institute of Oceanography Dona Paula, Goa, 21 – 22 February 2013

Honrao BK, Misra SC, Oak MD

51st AIW&BP workshop, Jaipur, 24-27 August 2012

Jaybhay SA

3rd International Agronomy Congress, IARI, New Delhi, 26-30 November 2012

Kanekar PP, Kulkarni SO, Nilegaonkar SS, Sarnaik SS, Kshirsagar PR,Jog JP

First Indo-US International Conference on Polymers for Packaging Applications, Kottayam, Kerala, March – April 2012

Kumbhalkar B

Workshop, Advanced studies and hands-on training on plant DNA fingerprinting, Bose Institute, Kolkata, 20 September - 4 October 2012

Lanjekar V, Kanekar S, Singh K, Gophane R, Dabir A, Honkalas V, Saxena N, Valentine P

Microbes: Molecular Ecology and Systematics, MCC-NCCS, Pune 6-7 September 2012

Misar A, Rajopadhye A

Workshop, Metals in health and diseases, MACS-Agharkar Research Institute Pune, 8 January 2013

Mukherjee P

XXV Winter School on Plant Genetic Engineering, Madurai Kamaraj University, Madurai, 3-17 September 2012

Naik DG

National Conference on Phytochemistry: Recent Trends and Challenges, BN Bandodkar College of Science, Thane, December 2012

Panchang R

PAGES 2nd Young Scientist Meeting, 11– 12February 2013 and PAGES 4th Open Science Meeting, Goa, 13– 16 February 2013

Patil RM

Indian Science Congress, Kolkata, 3-7 January 2013

Philips V

Meeting, DBT projects, ICRISAT, Hyderabad, 11-12 October 2012

Meeting, DUS training on soybean and germplasm, DSR, Indore, 28-29 September 2012

Ratnaparkhi A

Control in biological systems, National Centre for Biological Sciences, Bangalore, January 2013; Genes, Circuits and the Development of Behavior, Tata Institute of Fundamental Research, Mumbai, March 2013

Sharma R, SinghSK

Morphological and molecular studies reveal a new species of Gymnoascus (Gymnoascaceae, Onygenales) recovered from Indian soil. 18th International Congress of International Society for Human and Animal Mycology, Berliner Congress Centre, Berlin Germany, June 11-15, 2012. Poster

Tamhankar SA, Oak M

Conference, Genomics for Crop Improvement, Institute of Bioinformatics and Applied Biotechnology, Bangalore, 18-20 February 2013

Taware SP

QRT for soybean, UAS, Dharwad, 3 May 2012

Tetali S

52nd Annual conference of Maharashtra Rajya Draksha Bagayatdar Sangh, Pune, 18-19 August 2012

PhD degree award

Candidate	Title	Guide, Co-Guide
Barve A	Analysis of response of hydra to ultraviolet radiation	Ghaskadbi S
Dangi RS	Diversity in the genus Trigonella: Molecular and chemical characterization	Rao VS
Gamre PG	Palaeoflorist Diversity of the Deccan Intertrappean bed of Wardha District, Maharashtra, India and its Environmental Significance	Bonde SD
Gite S	Study towards development of polyphenol enriched food supplements using indigenous plant materials and assessing their multifunctionality	Nilegaonkar SS
Jotshi J	Microbial production of collagenolytic protease and its application in recovery of value added products	Kanekar PP
Kadam N	Studies in nutritional aspects of bone health in premenarchal girls and postmenopausal women	Chiplonkar SA
Kasarkar AR	Ethnobotanical studies in family Zinziberacea from South-Western Maharashtra with special reference to Alpinia and Zingiber	Kulkarni DK
Mishra P	Studies on Chitnolytic fungi and their Extracellular Chitanase system	Nilegaonkar S, Singh SK
Nema P	Genetic and Functional Diversity of Acinetobacter Sp. in Wheat Rhizosphere	Dhakephalkar PK
Pal A	Studies on remediation of arsenic from groundwater	Paknikar KM
Pandit D	Studies in relationship of nutritional status with metabolic syndrome in children and risk of sub-clinical atherosclerosis	Chiplonkar SA
Parab P	Assessment of abdominal obesity for screening NCD risks among affluent adults from India	Rao S
Patil PV	Studies on traditional agricultural practices and food grain management from Bhor (Pune District) and Mahad (Raigad District), Maharashtra State	Kulkarni DK
Ranade P	Investigating docosahexaenoic acid status in relation to prematurity and cognition	Rao S
Reddy PC	Insulin signaling in regeneration and pattern formation in hydra	Ghaskadbi S

Candidate	Title	Guide, Co-Guide
Salunke RJ	Comparative pharmacognosy of medicinally important species of genus Carissa	L.Ghate VS
Surekha KL	Role of growth factors in cell-cell signaling during angiogenesis	Ghaskadbi S
Thombre RS	Studies on production of Cyclodextrin glycosyl transferase (CGTase) using alkaliphilic bacteria	Kanekar PP
Umrani R	Studies on antidiabetic activity of zinc based sub-micronic preparations	Paknikar KM
Yadav S	Study of prebiotic potential of some indigenous plant materials and their possible health benefits	Nilegaonkar SS

Supervision of Postgraduate Students

(Guide, Co-guide, Student, Thesis)

PhD

Behera BC

Sonone A: Studies on antimicrobial, antioxidant, cardiovascular protective and antitumor activities of selected *in vitro* culture of lichens

Dhakephalkar PK, Ranade DR

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

Dahigaonkar 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

Barve A: Analysis of response of hydra to ultraviolet radiation

Ghodke K: Reactive oxygen species and chick embryonic development

Reddy PC: Insulin signaling in regeneration and pattern formation in hydra

Surekha KL: Role of growth factors in cell-cell signaling during angiogenesis

Kanekar PP, Naik DG

Borgave S: Studies on production of antimicrobial compounds by alkaliphilic bacteria isolated from Lonar Lake

Kulkarni MS: Studies on production and characterization of antibiotic like compounds from thermophilic actinomycetes

Kanekar PP, Sarnaik SS

Patil VP: Microbial remediation of wastewater containing Nitroexplosive Diaminodinitroethylene (FOX-7)

Kulkarni KG

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

Gurav SS: Significance of bioterbation and bioerosion in the Paleogene of Kachchh, India

Kulkarni PP

Ramteke S: Understanding role of copper and zinc in the aggregation and toxicity of Aβ peptide

Naik DG

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

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

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

Borgave S: Studies on production of antimicrobial compounds by alkaliphilic bacteria isolated from Lonar Lake (Co-Guide)

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 vivo*

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

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

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

Kulabhusan P: Phage display peptides for detection of pathogens

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

Ranade DR

Gophane RR: Bioconversion of starch industry waste to n-butanol

Kamalaskar LB: Investigation of a novel anaerobic strain DMHC-10 for polyphasic identification and biohydrogen production (Dhakephalkar PK – Co-guide)

Lanjekar VB: Isolation, identification and functional characterization of obligate anaerobic bacteria from human gastro-intestinal tract (Shouche Y – Co-Guide)

Nerlekar MR: Diversity of methanogens from oil reservoir in India (Dhakephalkar PK – Co-guide)

Singh KG: Studies on anaerobic bacteria producing butyric acid and butanol from distillery waste

Rao S

Raje S:Statistical model for early prediction of risk of low birth weight in rural Indian women

Rao A: Investigations on calcium during pregnancy with size at birth & metabolic risk in offsprings of wistar rats

Singh SK

Waingankar V: Studies on litter fungi from Western Ghats, India with special reference to some zygomycetes

Tamhankar SA

Cruze Lilly: Molecular analysis for leaf rust resistance in bread and durum wheat

More Manjusha: Molecular characterization of grape and its wild relatives

Upadhye AS

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

Member, Nominee– National/ International Committee/s

Ghaskadbi S

Member, Animal Sciences Program Advisory Committee under SERB, DST (June 2012-June 2015)

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

Expert Member, Technical Screening Committee, Small Business Innovation Research Initiative (SBIRI), Department of Biotechnology, Government of India 2010-2012

Member, Review Committee Research projects under different bilateral collaborations in the field of Agriculture and Environment Biotechnology, Department of Biotechnology, Government of India, 2010-2013

Appreciation

First prize in the poster session

Engineer AS, Dhakephalkar AP and Dhakephalkar PK. Microbial route for the synthesis of optically pure unnatural amino acids of industrial importance at MGM's Institute of Bioscience and Technology, Aurangabad, 2012

Best poster award

Gophane RR, Singh KG, Lapsiya KL and Ranade DR. Isolation of n-Butanol producing anaerobic bacteria from different environmental niches. 53rd AMI Conference, KIIT University, Bhubhaneswar, 22-25 November 2012

Prof. M Sabu award for the best paper

Punekar SA. Reappraisal of Family Eriocaulaceae in India. XXII Annual Conference of Indian Association for Angiosperm Taxonomy on Innovative Prospects in Angiosperm Taxonomy (ISIPAT-2012), Amravati, 28-30 October 2012

PD Seth Appreciation award 2011 for publication

Rajopadhye AA, Upadhye AS and Mujumdar AM, 2011. HPTLC method for analysis of Piperine in fruits of Piper species. Journal of Planar Chromatography, 24(1):57-59

Visits Abroad

Kumaran KPN, Limaye RB

XIII International Palynological Congress & IX International Organization of Palaeobotany Conference, Tokyo, Japan, 23-30 August 2012

Third Sino-Indian International Conference: Biodiversity and Environmental Changes in the Himalayas and International Conference on Plant Culture and Environment (ICPCE), Xinxiang City, Henan Province, China, 18-24 September 2012

Kamalaskar LB

Training on hydrogenase gene isolation from *C. beijerinckii* sp. and its cloning in *E.coli* host, University of Montreal, Canada, 9 June – 10 July 2012

MisraSC

Workshop, UK Biotechnology and Biological Sciences Research Council (BBSRC) and Bill & Melinda Gates foundation, 6–8 February 2013

South Asia CIMMYT Meeting, Kathmandu, Nepal, 16-20 December 2012

Philips V

IX World Soybean Research Conference, Durban, South Africa, 17-22 February 2013

Tetali S

Training programme, Integrated Breeding Multiyear Course, Generation Challenge Program, Wageningen, The Netherlands, 15-26 October 2012

Seminars/ Workshop/ Training Courses Organized

National Technology Day
11 May 2012

Technology and Agriculture
Dr Usha Zehr
Chief Technology Officer
Maharashtra Hybrid Seeds Company Ltd, Jalna

Hindi Pakhwada

31 August – 14 September 2012

Boli Hindi
Prof. Tukaram Patil
Head, Department of Hindi, University of Pune, Pune
Exhibition of Hindi books, 12 September 2012

Shri GB Deodikar Memorial Lecture
1 October 2012

Wheat cytogenetics: Then and now
Prof. PK Gupta
Hon. Emeritus Professor and NASI Senior Scientist
Meerut University, Meerut

Vigilance Awareness Programme
29 October - 3 November 2012
Pledge, 29 October 2012
Transparency in e-procurement, 30 October 2012

Shri AK Jondhale
Scientist E (Technical Officer)
National Informatics Centre, Pune

Shri GB Joshi Memorial Lecture

17 November 2012

Biomass to biofuels: where we are?

Dr K Ramasamy
Vice-Chancellor
Tamil Nadu Agricultural University, Coimbatore

Prof. SP Agharkar Memorial Lecture

18 November 2012

The proteins of the innate immune system as potent and resistance-free antibiotics

Dr Tej Pal Singh
Distinguished Biotechnology Research Professor
Department of Biophysics
All India Institute of Medical Sciences, New Delhi

International Symposium

A session on Holocene Palaeobiology and Tropical Palaeoecology under quaternary Ecosystems and Climate was accepted as a symposium for the joint meeting of 13th International Palynological Congress and 9th International Organisation of Palaeobot any Conference, Chuo University, Tokyo, Japan, 23-30 August 2012. Organizers: Navneeth KP Kumaran & Ruta Limaye

National Science Day celebrations

25 February-1 March 2013

Elocution competition

26 February 2013

Patil RM
First prize, Elocution competition, Genetically Modified Crops and Food Security

Open house,

28 February 2013

Genetically modified crops and food security

1 March 2013

Dr Vidya Gupta
Chief Scientist and Chair
Division of Biochemical Sciences
National Chemical Laboratory, Pune
Science exhibition, GMRT Khodad, Narayangaon,
28 February-1 March 2013

Annual Science Meeting

Indo-Australian Programme on Marker Assisted Wheat Breeding, (IAP-MAWB), Pune, 18-19 February 2013

Group Monitoring Workshop

All India Coordinated Project -Developing community based approach for prevention and management of anaemia through nutritional inputs and awareness among young rural woman in India, ARI, Pune, 27 June 2012

Workshop, Metals in Health and Diseases, ARI, Pune, 8 January 2013

National Workshop

National Fungal Culture Collection of India organized two batches of national workshop on 'Taxonomy, *Ex- situ* Conservation and Bioprospecting of Fungi' for training young and budding researchers for sustainable utilization of indigenous mycological resources. 31 participants from various organizations of 13 states in India benefitted from the workshop. The workshops were held during 25 May-8 June 2012 and 26 November-10 December 2012

WOS-B programme of DST

Orientation course for North zone women, INSA, Delhi, 28 May 2012

Orientation course for South zone women, IICT, Hyderabad, 5 June 2012

Orientation course for West and Central zone women, ARI, Pune, 7 June 2012

Dr DG Naik and Dr MK Gokhale coordinated the above programmes.

Group monitoring Workshop of WOS-B programme, INSA, New Delhi, 30-31 July 2011. Dr DG Naik and Dr MK Gokhale attended as experts.

WOS-B Project Selection Committee meeting, West Zone, ARI, Pune, 9-10 January 2013; North Zone, INSA, New Delhi, 14-16 January 2013; East Zone, Cotton College, Guwahati, 29-30 January 2013; South Zone, IICT, Hyderabad, 5-6 February 2013

Allied activities

ARI scientists contributed as postgraduate teachers, members of editorial boards of scientific journals, supervisors of postgraduate students' projects, speakers at Colleges, judges of scientific programmes, participants in radio programmes, authors of newspaper articles etc.

Maharashtra Association for the Cultivation of Science

Popularization of Science & Society Oriented Activities

MACS Marathi programme

22-23 March 2012

Workshop on Scientific Writing in Marathi Inaugurated by Prof. Nagnath Kottapalle, President, Akhil Bharatiya Marathi Sahitya Sammelan, 2013

MACS Twelve-week certificate course in field Botany

in collaboration with Nisargasewak, February - April 2013

Dr Kalyan Banerjee, President, MACS, Dr RM Godbole, Physician, Dr DR Bapat, Vice-President, MACS at the valedictory function

MACS Six-month certificate course in Home Gardening

July 2012-January 2013

Dr DR Ranade, Director (Officiating), ARI, Dr Kalyan Banerjee, President, MACS, Dr SB Gurav, Associate Director of Research, MARP, Ganeshkhind, Pune, at the valedictory function

Institutional Research Projects

Microbial Sciences Division

Project Code	Project Title	Investigator(s)	Associated staff and students
Microbiology			
MIC-10	Microbial diversity and conservation	Ranade DR, Paknikar KM, Dhakephalkar PK, Chitte RR,	Kelkar AS, Engineer A, Borgave SB
MIC-24	Pharmacological aspects of fibrinolytic enzyme actinokinase from thermophilic Streptomyces sp.	Chitte RR, Kanekar PP	Kulkarni GA
MIC-26	Biological hydrogen production	Ranade DR	Lapsiya KL, Kamalaskar LB
MIC-27	Production of enzyme collagenase	Kanekar PP, Nilegaonkar SS	Jotshi J
MIC-28	Isolation and characterization of obligate anaerobic bacteria from human gastrointestinal tract	Ranade DR	Lanjekar VB
MIC-29	Production of cerium sulphide pigment through microbial route	Kanekar PP, Ranade DR, Dhakephalkar PK,	-
MIC-30	Exploration of thermophiles for industrially important biomolecules and enzymes	Ranade DR, Dhakephalkar PK	Pore S, Pendse N
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

Project Code	Project Title	Investigator(s)	Associated staff and students
NBS-4	Miniature disposable PCR	Bodas DS, Paknikar KM	Kamat V
NBS-5	Nanomaterials Treatment to Seeds for Enhancing Germination Efficiency in Medicinal Trees	Rajwade JM, Upadhye AS, Paknikar Km1	Kshirsagar P

Plant Sciences Division

Botany

BOT-15	Digitizing AHMA	Datar MN	Gaikwad N, Awasarikar U
BOT-16	Seed and seedling studies on high valued medicinal plants of Maharashtra	Patel PR	Kshirsagar P, Gaikwad N
BOT-17	Repository of Crude drugs, Authentication service and Development of HPTLC profile library of PRS (Phytochemical Reference Standard)	Upadhye AS	Rajopadhye A, Dias L
BOT 18	Plant Community Studies on Selected Grasslands of Maharashtra.	Datar MN	-
BOT 20	Evaluation of antioxidant potential from plant resources: Fruit and vegetable juices.	Upadhye AS	Misar A

Genetics & Plant Breeding

GEN 04	Tagging of some important disease resistance and quality traits in wheat	Misra SC, Tamhankar SA, 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

Mycology & Plant Pathology

MYC-01	Studies of lichenized fungi including culture in vitro and bioactive metabolites	Behera BC, Sharma BO	SB Gaikwad, Pandit GS, Morey MV
MYC-03	Studies on forest fungi	Singh SK, Singh PN	Gaikwad SB, Sutar Somnath
MYC-06	To isolate endophytic fungi from medicinal plants and their metabolites	Singh SK	Pawle G
ARI/SP/ 160 (+ MYC02)	National Facility for Culture Collection of Fungi (03.03.2008 to 02.03.2013) & Fungal Identification Service	Singh SK	Singh PN, Sharma BO, Sharma R, Senthilarasu G,

Project Code	Project Title	Investigator(s)	Associated staff and students
			Mukherjee G, Rajesh Kumar KC, Pramod Kumar, Swami SV, Waingankar V
Animal Sciences Division			
Biometry & Nutrition			
New BIO-1	Role of maternal dietary calcium in relation to non-communicable diseases (NCDs) risks in adult offspring	Gokhale MK Joshi BN Kulakarni PP	Sarode JS, Apte PP, Sharma S
New BIO-2	Hepcidin-a Possible Indicator for assessing iron status	Kulkarni PP Joshi BN Gokhale MK	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	DandgeCN, 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 Waghole RJ	-
Geology			
GEO 17	Ichnofauna and Palaeoenvironment of Jaisalmer formation (Bathonian-callovian), Rajasthan	Kulkarni KG	Gurav S
Zoology			
ZOO-14	In- Vivo binding assay as a tool to study neuronal development	Ratnaparkhi A	-
ZOO-15	Structural and functional characterization of pattern-forming and DNMA repair genes from hydra	Ghaskadbi S Patwardhan V	Kavimandan 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 and Titus Susan, NMRL
Study of pheromones and semiochemicals	Central Bee Research and Training Institute, Pune	Naik DG, ARI and Wakode MT, CBRTI
Study of semio-chemicals for mealy bug control	National Research Centre for Grapes, Pune	Naik DG, ARI and Banerjee K, NRC
Hepcidin, a possible indicator of iron status	KEM Hospital and Research Center, Pune	Kulkarni PP, ARI and Naik SS, KEMHRC

SPONSORED PROJECTS

Sr No	Project Code	Project Title	Sponsored by	Investigators	Group	Grant Received (₹)
1	2	3	4	5	6	7
1	ARI/SP/001	All India Co-ordinated Research Project on Soybean (1.4.1968 onwards)	ICAR,New Delhi	Dr. S.P.Taware	Genetics	44,30,000
2	ARI/SP/002	All India Co-ordinated Fruit Improvement Project (1.10.70 onwards)	ICAR,New Delhi	Dr. S.C.Misra	Genetics	18,66,000
3	ARI/SP/003	All India Co-ordinated Wheat Improvement Project (1.4.1972 onwards)	ICAR,New Delhi	Dr. S.C.Misra	Genetics	65,34,000
4	ARI/SP/033	Production of Soybean Breeder Seeds of Annual Oil Seed Crops(2.2.88 onwards)	ICAR,New Delhi	Dr.S.P.Taware	Genetics	-
5	ARI/SP/034	Front-line Demonstrations of Annual Oil Seed Soybean(21.2.89)	ICAR,New Delhi	Dr.S.P.Taware	Genetics	15,618
6	ARI/SP/043	Front-line Demonstrations in Wheat (1.4.1993 onwards)	ICAR,New Delhi	Dr. S.C.Misra	Genetics	49,000
7	ARI/SP/096	Wheat Breeder Seed Scheme		Dr. Misra S.C.	Genetics	-
8	ARI/SP/118	Collaborative Multi locational evaluation for Bread wheat germplasm by NBPGR (March-2006 onwards)	ICAR, Karnal	Dr. S.C.Misra, Dr.B.K.Honrao	Genetics	2,41,980
9	ARI/SP/149	Generation of marker phytoconstituents and development of Repository for quality standards of Indian MEDICINAL PLANTS (30.3.2007 to 30.12.2011)	ICMR,New Delhi	Dr. D.G.Naik	Chemistry	4,52,100
10	ARI/SP/151	Interactions between fibroblast growth factor and insulin in early vertebrate morphogenesis(1.5.2007 to 30.4.2010)	DSTNew Delhi	Dr. Seema Borgave	Zoology	3,37,788
11	ARI/SP/152	WOS-B Scheme on behalf of S & S Division (7.9.2007 to 30.04.2013)	DSTNew Delhi	Dr. D.G.Naik, Dr.M.K.Gokhale	Chemistry	19,00,000
12	ARI/SP/155	Development characterization and field evaluation of honeybee attractants for enhacing crop yields (13.9.2007 to 31.9.2012)	DBT New Delhi	Dr. D.G. Naik	Chemistry	3,07,000
13	ARI/SP/160	National facility for culture collection of fungi (3.3.2008 to 2.3.2013)	DST New Delhi	Dr. S.K.Singh	Mycology	2,00,00,000
14	ARI/SP/166	Generating new wheat germplasm with enhanced draught/heat tolerance using AB genomes genetic diversity (15.10.2008 to 31.10.2013)	World Bank	Dr. S.C.Misra	Genetics	-
15	ARI/SP/168	Digitized Inventory of medicinal plant resources of Maharashtra (16.2.08 to 31.03.2013)	RGST Commission	Dr.A.S.Upadhye	Botany	7,50,000
16	ARI/SP/169	Development of blends and composites based on biodegradable polymer of microbial origin (24.3.2009 to29.6.2012)	DBT New Delhi	Dr.P.P.Kanekar	Microbiology	-
17	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	Dr. S. A. Tamhankar	Genetics	-
18	ARI/SP/173	Exploration of pristine and extreme habitats for themophilic anaerobes and their enzymes for industrial applications (12.8.2009 to 11.8.2012)	SERC	Dr. P.K.Dhakephalkar	Microbiology	-
19	ARI/SP/176	BIODEGRADATION OF Nitroexplosive (14.10.09 to 13.10.2012)	DBT New Delhi	Dr. P.P.Kanekar	Microbiology	4,10,000

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Group 6	Grant Received (₹) 7
20	ARI/SP/178	Development of environmentally benign nanomaterial-based enzyme formulation for biocontrol of PLANT pathogens and PESTS (1.9.2009 to 31.8.2012)	DBT New Delhi	Dr. K.M.Paknikar	Microbiology	-
21	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	Dr. S. A.Tamhankar	Genetics	9,31,000
22	ARI/SP/180	Marker Assisted selection for development of kunitz TRYPSIN inhibitor free SOYBEAN varities (29.9.2009 to 28.9.2014)	DBT New Delhi	Dr. P. Verghese, Dr.Manoj Oak	Genetics	3,47,000
23	ARI/SP/181	Molecular marker assisted development of biotic stress resistant wheat varities (13.11.2009 to 12.11.2014)	DBT New Delhi	Dr. S. A.Tamhankar	Genetics	11,38,000
24	ARI/SP/182	Metwork –Project- Draught Tolerance in WHEAT- Phenotyping for adaptive mechanisms to facilitate MAS based wheat breeding (23.11.2009 to 31.03.2014)	ICAR Karnal	Dr. Misra S.C.	Genetics	83,616
25	ARI/SP/183	Network -Project- physiological WATER use efficiency (root Trains) (23.11.09 to 31.03.2014)	ICAR Karnal	Dr. Misra S.C.	Genetics	3,26,275
26	ARI/SP/184	Developing Community based approach for prevention and management of ANEMIA through nutritional inputs and awareness among young rural women in India(1.12.09 to 30.11.2012)	DST New Delhi	Dr.B.N.Joshi, Dr.M.K.Gokhale	Biometry & Nutrition	-
27	ARI/SP/185	Recovery of Ret Species of Ceropegia from Western Ghats (10.01.2010 to 09.01.2015)	DBT New Delhi	Dr.A.S.Upadhye	Botany	4,00,000
28	ARI/SP/186	Importance of reactive OXYGEN species in early chick embryonic development (7.04.2010 to 6.4.2013)	DAE Mumbai	Dr.S.M.Ghaskadbi, Dr.V.Patwardhan	Zoology	2,51,376
29	ARI/SP/188	Epigenetics of Regeneric in Hydra (19.03.2010 to 18.03.2015)	DBT New Delhi	Dr. S.M.Ghaskadbi	Zoology	6,64,000
30	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	Dr. S.M.Ghaskadbi	Zoology	10,21,000
31	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	Dr. Anuradha Ratnaparkhi	Zoology	10,16,000
32	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	Dr. Prasad Kulkarni	Biometry & Nutrition	6,00,000
33	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	Dr. D. R. Ranade	Microbiology	-
34	ARI/SP/194	The role of SG2NA in tissue differentiation during chick embryonic development (17.1.2011 to 16.1.2014)	DST	Dr. S.M.Ghaskadbi	Zoology	4,00,000

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Group 6	Grant Received (₹) 7
35	ARI/SP/196	Resistant starch enriched Probiotic supplement for inflammatory bowel disorders (15.3.2011 to 14.3.2014)	DBT	Dr. S.S.Nilegaonkar	Microbiology	7,12,000
36	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	Dr. Anuradha Ratnaparkhi	Zoology	-
37	ARI/SP/198	Molecular breeding and selection strategies to combine and validate Qtl's for improving WVE and heat tolerance in Wheat (New GCP)	New GCP	Dr.S.C.Misra	Genetics	3,92,365
38	ARI/SP/199	Development of two stage Anaerobic bactorial process for butanol production from Industrial Wastes (2.6.2011 to 1.6.2014)	DBT	Dr. D.R.Ranade	Microbiology	4,55,787
39	ARI/SP/200	Studies on Diet Preferences of Plant Species Fevered by Indian Giant Squirrel (Ratufa Indica) and their Regeneration in Rai and Chaura areas of Bhimashankar (23.02.2011 to 30.8.2013)	Forest	Dr. M. Datar	Botany	-
40	ARI/SP/201	Women Scientist Scheme A (WOS-A) entitled "Documentation of mangrove forminifera of coastal Maharashtra with special reference to their environmental significance"(21.12.2011 to 20.12.2014)	DST	Dr. Rajani Panchang	Geology & Palaeontology	-
41	ARI/SP/202	"Molecular systematics, phylogeny and ecology of ceropegia L.(apocynaceae - asclepiadondeae) in India" (29.6.2012 to 28.6.2015)	DST SERB	Dr. Sachin Punekar	Geology & Palaeontology	-
42	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	Dr. D.R.Ranade & Dr.P.K.Dhakephalkar	Microbiology	-
43	ARI/SP/204	Process for biomethane production from marine algae (7.3.2012 to 22.5.2013)	Reliance	Dr. D. R. Ranade	Microbiology	3,00,000
44	ARI/SP/205	IRSONGC – Water Treatment (21.3.2012 to 21.3.2014)	ONGC	Dr. P.K.Dhakephalkar	Microbiology	-
45	ARI/SP/206	Biofertication of wheat for micronutrients through conventional and molecular approaches-Phase II (22.03.2012 to 21.03.2017)	DBT	Dr. S. A. Tamhankar	Genetics	12,11,600
46	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	Dr. B. C. Behera	Mycology	13,04,500
47	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	Dr. Niraj Verma	Mycology	-
48	ARI/SP/209	Inventorization of the Flora and Fauna from Selected Sacred Groves of Pune District (23.04.2012 to 22.04.2013)	Forest	Dr. A. S. Upadhye	Botany	2,55,300
49	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	Dr.Prasad Kulkarni, Dr.B.N.Joshi	Biometry & Nutrition	41,05,000

Sr No 1	Project Code 2	Project Title 3	Sponsored by 4	Investigators 5	Group 6	Grant Received (₹) 7
50	ARI/SP/211	Enhancing use efficiency of micronutrients: Novel delivery systems. (20.06.2012 to 19.06.2017)	ICAR	Dr. K. M. Paknikar	Microbiology	18,98,560
51	ARI/SP/212	Bioactive Molecules for the Treatment of the Alzheimer's Disease. (03.09.2012 to 03.09.2015)	DBT	Dr.A.M.Bapat, Dr.P.P.Kulkarni	Biometry & Nutrition	10,20,000
52	ARI/SP/213	Developing rapid diagnostics for the detection of Aspergillosis. (03.10.2012 to 2.10.2015)	DBT	Dr.K.M.Paknikar	Microbiology	11,60,800
53	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	Dr. D. G. Naik	Chemistry	5,00,000
54	ARI/SP/215	Chitosan based hydrogel nanoparticles for applications in wound healing (3.10.2012 to 02.10.2015)	DBT	Dr. Kavita Pal	Nanobio-science	8,30,000
55	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	Dr. Mandar Datar	Botany	5,10,600
56	ARI/SP/218	Exploitation of inter-specific biodiversity for Wheat Improvement (01.03.2013 to 28.02.2018)	DBT	Dr. S. C. Misra	Genetics	42,46,000
57		Testing of Soybean	KAN BIOSYS	Dr. Taware	Genetics	1,60,000
58		Testing of Wheat	KAN BIOSYS	Dr. Honrao	Genetics	80,000
59		Late quaternary vegetation and climate changes in southwest India: Evidence from sediment archives of Kollam alppuzha coastal plains of the South Kerala sedimentary basin	CSIR	Dr. K.P.N.Kumaran (Emeritus Scientist)	Geology	2,40,000
60		Cyanobacteria as biomarkers of hydrological changes in the Late Quaternary deposit of South Kerala Sedimentary basin, South Western India	CSIR	Dr. Ruta Limaye (Senior Research Associate)	Geology	6,65,260
		TOTAL Rs.				**6,45,19,525**

Personnel (as of 31.03.2013)

Director (Officiating)
Dr. D.R. Ranade (Sc.G)

Animal Sciences Division

Dr S.M. Ghaskadbi, Sc.G, Head

Biometry & Nutrition Group

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

Chemistry Group

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

Geology & Palaeontology Group

Dr. (Ms) KG Kulkarni, Sc.C
Shri. P.G.Gamre, Tech. Asst. B
Shri S.S. Deshmukh, Lab. Asst. D
Shri N.S. Mane, Lab Attd. B

Zoology Group

Dr. S.M. Ghaskadbi, Sc.G, I-Charge, Zoology & SEM Facility
Dr. (Ms) V.G. Patwardhan, Sc.E
Dr. Mrs. A. Ratnaparkhi, Sc.D
Shri M.B. Daware, Tech. Officer A
Shri V.B. Sindol, Tech. Asst. B
Mrs. R.B. Londhe, Tech. Asst. B

Microbial Sciences Division

Dr. K.M. Paknikar, Sc. G, Head
Dr. P.K. Dhakephalkar, Sc.E
Dr. (Ms) S.S. Nilegaonkar, Sc.D
Dr. R.R. Chitte, Sc.C
Mr. P.R. Kshirsagar, Sc.B
Dr. (Ms) D.C. Kshirsagar, Tech. Officer B
Ms. A.S. Kelkar, Tech. Officer A
Shri. V.K. Nalavade, Lab Asst .D
Shri. V.M. Lanjekar, Lab Asst. B
Ms JV Deshpande, Pvt. Secretary
Shri G.M. Ingale, Lab Attd. B
Shri S.M. More, Lab Attd. B

Nanobioscience Centre

Dr. K.M. Paknikar, Sc.G, In-Charge
Dr. (Ms) JM Rajwade, Sc.C
Dr. D.S. Bodas, Sc.C
Dr. Vandana Ghormade, Sc. C
Shri SS Waghmare, Lab Asst. B
Ms. SS Kalekar, Asst. A

Virology

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

Plant Sciences Division

Dr. S.C. Misra, Sc.E & In-charge

Botany Group

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

Genetics & Plant Breeding Group

Dr. S.C. Misra, Sc.E, In-Charge
Dr. S.P. Taware, Sc.E
Dr. (Ms) S.A. Tamhankar, Sc.E
Dr. B.K. Honrao, Sc.D
Dr. Mrs. S.P. Tetali, Sc.C
Dr. P. Varghese, Sc.B

Dr. M.D. Oak, Sc.B
Mr. S.A. Jaybhay, Sc.B
Shri A.M. Chavan, Tech. Officer A
Shri V.M. Khade, Tech. Officer A
Shri V.D. Surve, Tech. Officer A
Mr. K.D. Gole, Lab. Asst. B.

Mycology & Plant Pathology Group

Dr. S.K. Singh, Sc.D
Dr B.C. Behera, Sc.D
Dr. P.N. Singh, Sc.B
Shri B.R. Kakade, Tech. Officer A
Dr. (Ms) B.O. Sharma, Tech. Officer A
Mr. S.B.Gaikwad, Tech. Asst.

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

Shri K.V. Tiwari, Attendant A
Shri V.M. Gosavi, Attendant A

Administration

Shri G Barik, A.O.
Shri P.S Pujari, Officer B
Ms V.V. Dunakhe, Officer A
Shri A.D. Joshi, Asst. B
Shri CD Nagpure, Asst. B
Ms M.B. Tiwari, Asst. B
Ms. M.M. Kopargaonkar, 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
Shri S.P. Balsane, Attd. A

Stores

Shri P.C Bora, Officer B & In-Charge,
Shri V.B. Bhalerao, Officer A
Mrs. V.G. Tallu, Officer A
Shri D.S. Zade, Assistant B

Instrumentation Unit

Shri A.V. Chaudhari, Tech. Officer C
Ms. Manisha Khrade, Tech. Officer B
Shri B.N. Shinde, Technician D
Shri S.S. Kachi, Technician C
Shri S.B. Karanjekar, Attendant. D
Dr. R.M. Patil, Tech. Officer A
Ms. S.P. Karkamkar, Tech. Officer A
Mr. J.H. Bagwan, Tech. Asst. B
Shri B.D. Idhol, Tech. Asst. B
Shri S.V. Phalke, Tech. Asst. B
Shri B.N. Pulje(Waghmare) Tech. Asst. A
Mrs. A.A. Deshpande, 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 L.S. Chavan, Lab Attd. D
Shri S.S. Khomane, Lab Attd. D
Shri M.T. Gurav, Lab Attd. C
Shri T.A. Kolte, Lab Attd. C
Shri R.D. Shinde, Lab Attd. C
Shri S.L. Bhandalkar, Lab Attd. A
Shri S.R. Kachhi, Lab Attd. A
Shri S.V. Ghadge, Lab Attd. A
Dhri D.L. Kolte, Lab Attd. A

Photography Unit (under I/C, Geology)

Shri BA Kawthekar, Technician D

Accounts

Sqn Ldr S Francis (Retd), Fin & A/c. Officer
Shri S.K. Walambe, Officer B
Ms. P.P. Pathak, Officer A
Ms. S.A. Bibikar, Officer A
Ms. S.A. Tembe, Officer A
Shri S.V .Kulkarni, Asst. B
Ms. T.V. Kuhrade, Asst. A

Purchase

Shri P.V. Gosavi, Officer C/ SPO
Shri H.N. Mate, Officer B
Shri A.G. Dhongade, Sr. PS
Ms. U.S. Kulkarni, Asst. B
Ms. D.V. Gavade, Asst. A
Shri A.T. Salvi, Attd. B

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 B

Other Technical Staff

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

Assessment Promotions

Technical

Dr. R.M. Patil, Tech. Officer A
Mrs. S.P. Karkamkar, Tech. Officer A
Mrs. R.J. Londhe, Tech. Asst. B
Shri S.B. Gaikwad, Tech. Asst. B
Mrs. J.S. Sarode, Lab Asst. C
Mrs. N.S. Gaikwad, Lab Asst. B
Shri D.N. Bankar, Lab Asst. B
Shri D.H. Salunkhe, Lab Asst. B

Vacancy based Promotions

Shri P.S. Pujari, Officer B
Shri H.N. Mate, Officer B
Shri A.G. Dhongade, Sr. PS
Mrs. J.V. Deshpande, PS
Mrs. V.V. Dunakhe, Officer A
Mrs. P.P. Pathak, Officer A
Mrs. S.A. Bibikar, Officer A
Shri V.B. Bhalerao, Officer A
Mrs. S.A. Tembe, Officer A
Mrs. V.G. Tallu, Officer A
Shri R.P. Janrao, Asst. Lib. & Inf. Officer
Shri C.D. Nagpure, Assistant B
Shri A.D. Patil, Assistant B
Mrs. M.B. Tiwari, Assistant B
Shri B.B. Gavali, Driver Special Gr.
Shri A.D. Sonvalkar, Driver Gr.I
Shri S.B. Karanjekar, Attd. D
Shri R.D. Shinde, Attd. C
Shri M.T. Gurav, Attd. C

Appointments

Mr. T.N. Pardeshi, Tech. Officer A - 27.07.2012
Mr. S.V. Phalke, Tech. Asst. B - 22.06.2012
Smt. K.K. Patil, Tech. Officer A - 20.03.2013

Superannuation

Dr. Mrs. S.S. Sarnaik, Sc. D - 30.11.2012
Smt. Annie Kochitty, Sr. P.S. - 30.11.2012
Shri C.M. Awere, Tech. Officer A - 31.07.2012
Shri R.B. Kale, Driver - 30.06.2012
Shri A.G. Bhide, Attd. D - 31.05.2012

Resignation

Dr. P.R. Patel, Sc. B -05.12.2012
Mrs. A.L. Bipinraj, Tech. Asst. B - 05.11.2012

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 2011-2013

Group	SC	ST	OBC	General	Total
A	–	–	–	–	–
B	–	–	2	1	3
C	–	–	–	–	–
Total	–	–	2	1	3

Emeritus Scientist

Dr. K.P.N. Kumaran, CSIR

Research Associates

ARI PROJECTS

1 Dr. (Mrs). Anagha Rajopadhye
2 Dr. (Mrs). Papiya Mukherjee
3 Dr. (Mrs.) Rinku Umrani
4 Dr. Kaushal Lapsiya
5 Dr. (Mrs.) Prachi Kshirsagar
6 Dr. (Ms.) K.L Surekha

SPONSORED PROJECT

1 Dr. Trushna Katore
2 Dr. Sarvamangala Cholin
3 Dr. (Mrs). Aditi Karandikar
4 Dr. Deepak Kasote

Senior Research Fellows

ARI PROJECTS

1 Shraddha Deshmukh

SPONSORED PROJECT

1 Vaishnavi Kulkarni
2 Ajit Raut
3 Harshada Vaidya
4 Amol Mali
5 Manjusha More
6 Mahesh Chitrakoti

Junior Research Fellows

ARI PROJECTS

1 Aditi Kavimandan
2 Milind Chaudhari
3 Nimisha Singh
4 Kashmiri Jadhav

SPONSORED PROJECT

1 Samiksha Khade
2 Varsha Honkalas
3 Dnyanesh Ranade

Research Students

ARI PROJECTS

1 Shraddha Bachute
2 Aboli Lale
3 Mangesh Morey
4 Anupama Engineer
5 Ila Abhijit Marathe
6 Umesh Awasarkar

SPONSORED PROJECT

1 Richa Rajani
2 Priyanka Waghmode
3 Charuta Gole (Patwardhan)
4 Paurnima Ladhe
5 Manasi Nerlekar
6 Kajal Singh

7 Laurelle Dias
8 Sona Sharma
9 Manasi Hardikar
10 Shweta Gurav
11 Neelam Kapse
12 Gaurav Kulkarni
13 Soham Pore
14 Somnath Sutar
15 Gauri Pawle
16 Shreyas Pradhan
17 Amit Ram Morarka
18 Ninad Puranik
19 Niraj Ghatpande

7 Prafull Shinde
8 Snehal Gite
9 Anagha Basargekar
10 Aboli Kulkarni
11 Priatam Jadhav
12 Girija Ayachit
13 Amruta Alwaris
14 Rekha Gophane
15 Priyanka Gijare
16 Ashwini Dabir
17 Neha Saxena
18 Ashwini Gaikwad
19 Bapi Mandal
20 Swapnil Savale
21 Gulshan Walke
22 Prachi Pathare

Fellows With Own Fellowship

1 Dr.Neeraj Verma, CSIR - RA
2 Supriya Yadav, ICMR-RA
3 Dr.(Mrs.) Ruta Limaye, CSIR-SRF
4 Shefali Ramteke, UGC-JRF
5 Kumari Shweta, UGC-JRF
6 Jyoti Kumbhar, CSIR-JRF
7 Amruta Paranjape, CSIR-JRF
8 Swati Asani, CSIR-JRF
9 V.M. Kulkarni, CSIR-JRF
10 Ashwin Dapkekar, UGC-JRF
11 Shailaja Agarwal, CSIR-JRF
12 Alisha Galande, UGC-JRF
13 Anuprita Turwankar, UGC-JRF
14 Prasad Bhagat, CSIR-SRF
15 Prabir Kulbhushan, ICMR-JRF
16 Dr. Sachin Punekar, SERB Young Scientist
17 Sagar Kanekar, CSIR-SRF
18 Preeti Arora, CSIR- JRF
19 Rajani Panchang, PI, WOS-A Project
20 Yamini Ginotra, CSIR-SRF
21 Leena Kamalaskar, CSIR-SRF
22 Bhagyashree Kumbhalkar, CSIR-SRF
23 Paresh Deshpande, CSIR-SRF
24 Archika Bapat, Res. Scientist/PI
25 Rohini Chikate, UGC-JRF
26 Vivek Kamat, UGC-JRF

Temporary Staff Under Sponsored Projects

1 Savita Mapari (DEO)
2 Sneha Devi (Tech. Asst.)
3 Mamta Singh (Lab. Asst.)

राजभाषा

आघारकर अनुसंधान संस्थान में राजभाषा संबंधी संसदीय समिति की दूसरी उप समिति का निरीक्षण दिनांक 06 नवम्बर से 07 नवम्बर 2012 को हुआ ।

समिति के सभासद

- डॉ. प्रसन्न कुमार पाटसाणी, संसद सदस्य (लोक सभा)
- श्री. रघुनंदन शर्मा, संसद सदस्य (राज्य सभा)
- श्री. श्याम सुन्दर, सचिव
- डॉ. श्रीप्रकाश शुक्ल, अवर सचिव
- श्री. जी.एस. रावत, हिन्दी अधिकारी, विज्ञान और प्रौद्योगिकी मंत्रालय, नई दिल्ली
- श्री. राजेश झा,रिपोर्टर
- डॉ. नीरज शर्मा, वरिष्ठ वैज्ञानिक, विज्ञान और प्रौद्योगिकी मंत्रालय, नई दिल्ली
- श्री. हरकेश मीणा, सहायक निदेशक,(रा.भा.) विज्ञान और प्रौद्योगिकी मंत्रालय, नई दिल्ली

संस्थात्मक समिति के सभासद

- डॉ. दिलीप रानडे, निदेशक (स्थानापन्न)
- डॉ. दत्तात्रय नाईक, संपर्क अधिकारी
- श्री. गजेंद्र बारीक, प्रशासनिक अधिकारी
- डॉ. सतीश मिश्रा, अध्यक्ष
- डॉ. संजय सिंह, वैज्ञानिक
- श्रीमती मंजुषा तिवारी, सहायक

संस्थागत कार्य

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

- संस्थानके मेन बिल्डींग में हररोज आज का शब्द (हिन्दी तथा अंग्रेजी) में लिखा जाता है । हिन्दी शब्दों से परिचित करवाने हेतु हररोज एक शब्द और उसके अंग्रेजी समशब्द का प्रदर्शन ।
- हिन्दी और अंग्रेजी में वार्षिक प्रतिवेदन कर प्रकाशन व्दिभाषी में प्रकाशित किया जाता है ।
- संस्थानकी वेब साइट में हिन्दी का प्रयोग ।
- सभी कम्प्यूटरों पर 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 हिन्दीमें भेजे जाते है । संस्थान से भेजे जानेवाले पत्रोंमें 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 संस्थानसे जानेवाले सभी पत्रोंकी प्रविष्ठियाँ हिन्दी में की जाती है ।
- सभी वैज्ञानिक, कर्मचारी अपनी टिप्पणियाँ हिन्दी में लिखते है ।
- हाजिरी रजिस्टर में कए 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, साइन बोर्ड, सीलें, पत्र शीर्ष, नामपट्ट हिन्दी में किए गए है ।
- हिन्दी पुस्तकों की खरीद में वृध्दि हुई है ।
- व्दिभाषी (हिन्दी+अंग्रेजी) शब्दकोष/शब्दावली तथा सहायक साहित्य खरीदे गए है ।
- संस्थानमें भर्ती तथा पदोन्नति आदि के लिए आयोजित साक्षात्कार हिन्दीमें 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 2012-13

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, 2013 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 our knowledge and belief were necessary for the purpose of our Audit.

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

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

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

   (I) In the case of the Balance Sheet, of the state of affairs of the Centre as at 31st March 2013

   (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: 23rd September, 2013

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, 2013**

Sr.No.	Particulars	Remarks
A	Whether accounts are maintained regularly and in accordance with the provisions of the Act and the rules	YES
B	Whether receipts and disbursements are properly and correctly shown in the accounts	YES
C	Whether the cash balance and vouchers in the custody of the manager or trustee on the date of audit were in agreement with the accounts	YES
D	Whether all books, deeds, accounts, vouchers or other documents records required by the auditor were produced before him	YES
E	Whether a register of movable and immovable properties is properly maintained, the changes therein are communicated from time to time to the regional office and the defects and inaccuracies mentioned in the previous audit report have been duly complied within	YES
F	Whether the manager or trustee or any other person required by the auditor to appear before him did so and furnished the necessary information required by him	YES
G	Whether any property or funds of the Trust were applied for any object or purpose other than the object or purpose of the Trust	NO
H	Whether tenders were invited for repairs or construction involving expenditure exceeding Rs. 5000/-	YES
I	Whether any money of the public trust has been invested contrary to the provisions of Section 35	NO
J	Alienation, if any of the immovable property contrary to the provisions of Section 36 which have come to the notice of the auditor	NO
K	All cases of irregular, illegal or improper expenditure or failure or omission to recover monies or other property belonging to the public trust or of loss or waste of money or other property thereof and whether such expenditure, failure, omission loss or waste was caused in consequence of breach of trust or misapplication or any other misconduct on the part of the trustees or any other person while in the management of the trust	NO
L	Whether the minutes books of the proceedings of the meeting is maintained	YES
M	Whether any of the trustees has any interest in the investment of the trust	NO
N	Whether the irregularities pointed out by the auditors in the accounts of the previous year have been duly complied with by the trustees during the period of audit	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: 23rd September, 2013

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 31.03.2013

Amount - Rs.

FUNDS AND LIABILITIES	SCH.	AMOUNT Rs.	PROPERTY AND ASSETS	SCH.	AMOUNT Rs.
CAPITAL ACCOUNTS	A	10,660,131	FIXED ASSETS	C	9,271,133
OTHER LIABILITIES	B	115,886	Investments	D	11,443,831
INCOME & EXP.A/C (Sub Schedule 4)		11,531,975	Deposits & Advances	E	1,481,126
			Cash & Bank Balances	F	111,902
TOTAL		**22,307,992**	**TOTAL**		**22,307,992**

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

23rd September, 2013

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SCHEDULE "A" CAPITAL ACCOUNT

Amount - Rs.

PARTICULARS	SUB-SCH	AMOUNT Rs.
TRUST FUND OR CORPUS	1	10,276,284
OTHER EARMARKED FUNDS	2	383,847
TOTAL(RS.)		**10,660,131**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SCHEDULE "B" CURRENT LIABILITIES

Amount - Rs.

PARTICULARS	SUB-SCH	AMOUNT Rs.
OTHER LIABILITIES	3	115,870
TDS - CONTRACTOR		16
TOTAL(RS.)		**115,886**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SCHEDULE "C" FIXED ASSETS

Amount - Rs.

PARTICULARS	SUB-SCH	AMOUNT Rs.
IMMOVABLE PROPERTIES	5	9,150,197
FURNITURE AND DEAD STOCK	6	120,936
TOTAL(RS.)		**9,271,133**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

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. Nagpur	Share of Rs. 25 each			Not quoted	
	Certificate No.1343 bearing Sr.No.29114 to 29126		13 ordinary	21.01.1949		
	Certificate No. 551 bearing Sr.No. 3717 to 3756		40 ordinary	10.06.1940		
2	HINDUSTAN MOTORS LTD.	Share certificate No.33932 Shares of Rs. 10/- each 4632651-4632700	50 ordinary			500
3	BANK OF MAHARASHTRA	474069		30.12.2011	30.12.2014	300,000
		474070		30.12.2011	30.12.2014	300,000
		555251		10.01.2012	10.01.2013	29,827
		60126451909		1.3.2013	1.3.2014	200,000
4	I.D.B.I. BANK	5.02107E+14		25.10.2011	30.10.2013	693,412
		99641		25.10.2011	30.10.2013	693,412
		35836		04.07.2011	05.07.2013	812,322
		15181		09.06.2010	13.06.2013	1,000,000
		15190		09.06.2010	13.06.2013	1,000,000
		15206		09.06.2010	13.06.2013	1,000,000
5	INDIAN BANK	741859		09.03.2012	07.03.2015	500,000
		603254988		09.03.2012	07.03.2015	500,000
		9225971		9.8.2012	6.8.2015	200,000
		6083258900		24.11.2012	24.11.2014	1,000,000
		6083254989		24.11.2012	24.11.2014	500,000
		60832555347		24.11.2012	24.11.2014	1,000,000
6	BANK OF BARODA	249183		02.03.2012	02.03.2014	65,154
7	UNION BANK OF INDIA	4.894E+15		27.12.2012	27.12.2013	547,879
8	BANK OF INDIA	5.03451E+13		24.11.2012	24.11.2014	1,100,000
	GRAND TOTAL					**11,443,831**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SCHEDULE "E" DEPOSITS & ADVANCES

Amount - Rs.

PARTICULARS	AMOUNT Rs.	AMOUNT Rs.
DEPOSITS : (As per last Balance Sheet)		
Telephone Deposit	15,000	
Deposit with Court	15,000	30,000
ADVANCES :		
Income Tax Deducted at Source	23,484	
(As per last Balance Sheet)		
	-	
Less. Refund Received during the year		-
TDS IDBI Bank for F.Y. 2012-13	12423	
		35,907
Interest accrued on Investments		
(Subject to confirmation from bank & other agencies)		
As per last Balance Sheet)	694,476	
Less Realised during the year		
Add : For the year 2012-13	720,743	1,415,219
TOTAL Rs.		**1,481,126**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SCHEDULE "F" CASH & BANK BALANCES

Amount - Rs.

PARTICULARS	OPENING BALANCE RS.	CLOSING BALANCE RS.
Cash in Hand	23327	286
BANK :-		
With Bank of Maharashtra	99641	75004
Erandwana Branch in Savings A/c No.9709		
With State Bank of India	198972	31170
Deccan Gymkhana Branch in S.B. A/c No. 01100005452		
With Union Bank of India,	858867	5442
F.C.Road Branch in S.B.A/c 48941261091951		
TOTAL (RS.)	**1,180,807**	**111,902**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SUB SCHEDULE "1" TRUST FUND OR CORPUS

Amount - Rs.

PARTICULARS	AMOUNT RS.
As per Last Balance Sheet	10,222,130
Add: Capital Account (Office Equipments)	54,154
TOTAL(RS.)	**10,276,284**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SUB SCHEDULE "2" OTHER EARMARKED FUNDS

Amount - Rs.

PARTICULARS	AMOUNT RS.
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

Schedules to and forming part of Balance sheet as on 31.3.2013

SUB SCHEDULE "3" OTHER LIABILITIES

Amount - Rs.

PARTICULARS	AMOUNT RS.
Advance Payable to Mr. B.K. Kale (as per last balance sheet)	886
ARI Account	103,232
ARI Staff TDS Refundable	8,381
Audit fees payable	3,371
TOTAL (RS.)	**115,870**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SUB SCHEDULE "4" INCOME & EXPENDITURE ACCOUNT

Amount - Rs.

PARTICULARS	AMOUNT RS.	AMOUNT RS.
Opening Balance	10,517,198	
Add: Surplus during the year as per Income & Expenditure Account	1,014,777	
		11,531,975
TOTAL (RS.)		**11,531,975**

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

Schedules to and forming part of Balance sheet as on 31.3.2013

SUB SCHEDULE "5" : IMMOVABLE PROPERTIES

Amount - Rs.

	Particulars	Rate of Depreciation	GROSS BLOCk			DEPRECIATION BLOCK					WDV
			Cost as on 1.4.12	Additions during the year	Total Cost as on 31.3.2013	Upto 31.3.2012	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	Total as on 31.3.2013	as on 31.3.2013
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	81,470	2,880	-	2,880	84,350	30,850
4	Microbiology Building	2.50%	3,389	-	3,389	2,477	85	-	85	2,562	827
	(Refer Note A)					-	-	-			
5	Land Development		202,583	-	202,583	-	-	-	-	-	202,583
	Expenses at Hol					-	-	-			
					-	-	-	-			
	TOTAL (RS.)		**9,237,109**	**-**	**9,237,109**	**83,947**	**2,965**	**-**	**2,965**	**86,912**	**9,150,197**

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 31.3.2013

SUB SCHEDULE "6" FURNITURE AND DEAD STOCK

Amount - Rs.

Particulars		Cost as on 1.4.2012	GROSS BLOCk Additions during the year	Total cost as on 31.3.2013	Rate of Depre-ciation	DEPRECIATION BLOCK Up to 31.3.2012	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	Total as on 31.3.2013	WDV as on 31.3.2013
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	192,882	54,154	247,036	20%	191,631	10,747	10,831	21,578	213,209	33,827
3.	Electric Fittings	9,870	-	9,870	10%	9,869	-	-	-	9,869	1
4.	Books	117,522	-	117,522	20%	116,037	-	-	-	116,037	1,485
5.	YType System for Grapes-Hol	110497	-	110,497	10%	22,100	11,050	-	11,050	33,150	77,348
	SUB TOTAL (A)(I)	**823,714**	**54,154**	**877,868**		**728,733**	**21,797**	**10,831**	**32,628**	**761,361**	**116,509**
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)	**831,296**	**54,154**	**885,450**		**732,200**	**21,797**	**10,831**	**32,628**	**764,828**	**120,624**
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)	**891,629**	**54,154**	**945,783**	**-**	**792,221**	**21,797**	**10,831**	**32,628**	**824,849**	**120,936**

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

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH 2013

Amount - Rs.

EXPENDITURE	AMOUNT Rs.	INCOME	AMOUNT Rs.
Depreciation : Immovable Properties	2,965	Interest (Realised)	
(By way of provision or adjustment)		on S.B. A/c	29,663
		On Investments	1,033,820
Establishment Expenses	101,788		
(As per Schedule H)		Donation in Cash	156,000
Capital Expenditure	54,154	Donation Recd. for V P Gokhale Award	190,000
Audit fees	3,371	Income from other Sources	77,155
(As per Schedule L)			
Legal Fees	156,000		
Depreciation : Furniture & Dead Stock	32,628		
Expenditure on the object of The Trust	120,956		
(As per Schedule K)			
Surplus Carried over to Balance Sheet	1,014,777		
TOTAL	**1,486,638**	**TOTAL**	**1,486,638**

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

23rd September, 2013

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 31.3.2012

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

Amount - Rs.

PARTICULARS	AMOUNT RS.
Expenditure out of Earmerked Donations	
Prof. V.P Gokhale Prize Expenses	16,280
Donation Expenses Prof. P.V.Sukhatme	750
Home Garden Course Expenses	23,463
Prof. S.P. Agharkar Memorial Day expenses	31,385
Smt.Parvatibai Agharkar Fellowship	14,400
Public Lecture	1,500
Marathi Vidnyan Workshop	12,992
Science Promotion Expenses	20,186
TOTAL (RS.)	**120,956**

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

SCHEDULE"L" : INCOME FROM OTHER SOURCES

Amount - Rs.

PARTICULARS	AMOUNT RS.
Sale of Publication	1,155
Fee for Home Gardening Course	76,000
TOTAL (RS.)	**77,155**

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

23rd September, 2013

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

STATEMENT OF RECEIPTS & PAYENTS FOR THE YEAR ENDED ON 31.3.2013

Amount - Rs.

RECEIPTS	SCH.	AMOUNT Rs.	PAYMENTS	SCH.	AMOUNT Rs.
Opening Balances	F	1,180,807	Establishment Expenses	H	101,788
Donation in Cash		156,000	Expenditure on Object of Trust	I	120,936
Interest Received On Savings Bank A/c		29,663	Audit Fees paid		3,371
			Legal Fees		156,000
Interest on Investments		244,461	Fixed Deposit with Banks		4,000,000
Income from Other Sources	G	77,155	Indirect Receipt & Payment	J	151,613,318
Encashment of FDR with Bank		3,400,000	Capital Expenditure		54,154
Indirect Receipt & Payment	J	150,883,383	Closing Balances	F	111,902
Donation Recceived for Prof.V.P.Gokhale Award		190,000			
TOTAL		**156,161,469**	**TOTAL**		**156,161,469**

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

23rd September, 2013

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 31.3.2013

SCHEDULE"G" : INCOME FROM OTHER SOURCES

Amount - Rs.

PARTICULARS	INCOME & EXP. ACCOUNT AMOUNT RS.	RECEIPT & PAYMENT AMOUNT RS.
Sale of Publication	-	1,155
Fee for Home Gardening Course	-	76,000
TOTAL (RS.)	**-**	**77,155**

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

SCHEDULE "H" : ESTABLISHMENT EXPENSES

Amount - Rs.

PARTICULARS	INCOME & EXP. ACCOUNT AMOUNT RS.	RECEIPT & PAYMENT AMOUNT RS.
Honorarium to Staff	62,913	62,913
Meeting Expenses	6,980	6,980
Miscellaneous Expenses (includes Advt.Expenses)	5,994	5,994
Postage Expenses	1,380	1,380
Travelling & Conveyance	22,615	22,615
Printing & Stationery	1,906	1,906
TOTAL (RS.)	**101,788**	**101,788**

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

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

Amount - Rs.

PARTICULARS	AMOUNT RS.
Expenditure out of Earmerked Donations	
Prof. V.P Gokhale Prize Expenses	16,280
Donation Expenses Prof. P.V.Sukhatme	750
Home Garden Course Expenses	23,463
Prof. S.P. Agharkar Memorial Day expenses	31,385
Smt.Parvatibai Agharkar Fellowship	14,400
Public Lecture	1,500
Marathi Vidnyan Workshop	12,992
Science Promotion Expenses	20,166
TOTAL (RS.)	**120,936**

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

SCHEDULE "J" : INDIRECT RECEIPTS & PAYMENTS

Amount - Rs.

PARTICULARS	RECEIPT & RS.	PAYMENT RS.
ARI Account	145,083,366	145,462,438
Schemes Account	5,748,618	6,095,765
T.D.S. Contractor	-	115
Advance to staff	40,299	43,000
TDS Professional fees	11,100	12,000
TOTAL	**150,883,383**	**151,613,318**

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 GG Agarkar Road, Pune as at 31st March, 2013 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, 2013 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 2013

   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 *s:* 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: 23rd September, 2013

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

Balance Sheet as on 31.03.2013

Amount - Rs.

Particulars	Schedule	Current Year	Previous Year
CORPUS/CAPITAL FUND AND LIABILITIES:			
CORPUS/CAPITAL FUND	1	46,860,968	33,729,218
RESERVES AND SURPLUS	2	0	0
EARMARKED/ENDOWMENT FUNDS	3	39,258,104	33,374,691
SECURED LOANS AND BORROWINGS	4	0	0
UNSECURED LOANS AND BORROWINGS	5	0	0
DEFERRED CREDIT LIABILITIES	6	0	0
CURRENT LIABILITIES AND PROVISIONS	7	169,222,423	143,757,256
TOTAL		**255,341,495**	**210,861,165**
ASSETS:			
FIXED ASSETS	8	87,153,936	75,445,042
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	101,776,425	71,986,810
INVESTMENTS-OTHERS	10	0	0
CURRENT ASSETS,LOANS,ADVANCES ETC.	11	66,411,134	63,429,313
MISCELLANEOUS EXPENDITURES (to the extent not written off or adjusted)			
TOTAL		**255,341,495**	**210,861,165**
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/-
Sqn. Ldr. S. Francis (Retd)
Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

23rd September, 2013

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

Schedules forming part of Balance Sheet as at 31.03.2013

Schedule 1 : Corpus/Capital Fund

Amount - Rs.

Particulars	Current Year		Previous Year	
Balance as the beginning of the year	33,729,218		8,229,660	
Add : Contributions towards Corpus/ Capital Fund (Schedule D)	39,321,239		49,515,527	
Add/ (Deduct) : Balance of Net Income/ (Expenditure)	(26,189,489)		(24,015,969)	
		46,860,968		33,729,218
Balance at the end of the year		**46,860,968**		**33,729,218**

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

Schedules forming part of Balance Sheet as at 31.03.2013

Schedule 2 : Reserves & Surplus

Amount - Rs.

Particulars	Current Year		Previous Year	
1. Capital Reserve :				
As per last Account	0		0	
Addition during the year	0		0	
Less: Transfer to Establishment expenses	0	0	0	0
2. Revaluation Reserve :				
As per last Account	0		0	
Addition during the year	0		0	
Less: Deductions during the year	0	0	0	0
3. Special Reserve : A.R.I. Reserve Fund :				
As per last Account	0		0	
Addition during the year	0		0	
Add: Interest accrued	0		0	
Less: Deductions during the year	0	0	0	0
4. General Reserve :				
As per last Account	0		0	
Addition during the year	0		0	
Less: Deductions during the year	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**

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

Schedules forming part of Balance Sheet as at 31.03.2013

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	32,676,111	567,012	4,185	127,383	33,374,691	22,834,550
b) Additions to the funds:	0	0	0	0	0	20,686
i. Donations/grants	0	0	0	0	0	0
ii. Income from investments made on account of funds.	3,042,379	17,811	350	6,641	3,067,181	1,642,586
iii. Amount received paid for 6th Pay Arrears	0	0	0	0	0	6,100,000
iv. Overhead Charges from Scheme	2,819,968	0	0	0	2,819,968	2,804,180
v. Refund from scheme for fellowship adv made	314,850				314,850	
vi. Other Misc. Income	0	0	0			3,345
Repayment of Advance from ARI					-	8,700,000
TOTAL (a+b)	**38,853,308**	**584,823**	**4,535**	**134,024**	**39,576,690**	**42,105,347**
c) Utilisation/Expenditure towards objectives of funds						14,930
i) Capital Expenditure						
Fixed Assets	0	0	0	0	0	0
Others	0	0	0	0	0	0
Advance paid to ARI	0	0	0	0	0	8,700,000
ii) Revenue Expenditure						
Salaries, Wages and allowances etc.	0	0	0	0	0	0
Rent	0	0	0		0	0
Other Administrative Expense	0	0	0	3,736	3,736	15,726
(Payment to CSIR, ICMR fellows- Temp. Advance	314,850	0	0	0	314,850	0
TOTAL (C)	**314,850**	**0**	**0**	**3,736**	**318,586**	**8,730,656**
NET BALANCE AS AT THE YEAR-END (a+b-c)	**38,538,458**	**584,823**	**4,535**	**1,30,288**	**39,258,104**	**33,374,691**

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

Schedules forming part of Balance Sheet as at 31.03.2013

Schedule 4 : Secured Loans and Borrowings

Amount - Rs.

Particulars	Current Year		Previous Year	
1. Central Government	0.00	0.00	0.00	0.00
2. State Government (Specify)	0.00	0.00	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		0.00
6. Debentures and Bonds	0.00	0.00		0.00
7. Others (Specify)	0.00	0.00		0.00
TOTAL	**0.00**	**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 31.03.2013

Schedule 5 : Unsecured Loans and Borrowings

Amount - Rs.

Particulars	Current Year		Previous Year	
1. Central Government	0.00	0.00		0.00
2. State Government (Specify)	0.00	0.00		0.00
3. Financial Institutions	0.00	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 31.03.2013

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 31.03.2013

Schedule 7 : Current Liabilities & Provisions

Amount - Rs.

Particulars	Current Year		Previous Year	
A. Current Liabilities :-				
1. Acceptances	0	0	0	0
2. Sundry Creditors:				
a) For Goods	0	509,645	0	520,390
3. Advances Received	0	0	0	0
4. Interest Accrued but not due on:				
a) Secured Loans/borrowings	0	0	0	0
b) Unsecured Loans/borrowings	0	0	0	0
5. Sundry Liabilities:				
a) Sales Tax	0	0	6,938	0
b) Culture Identification charges	2,667,244	0	1,943,123	0
c) Unpaid Salary	546,171	0	501,279	0
d) Income Tax (Contractor)	16,367	0	33,412	0
e) Service Tax Payable	636	0	10,243	0
f) Group Insurance	65,829	0	48,370	0
g) LIC	70,657	0	69,618	0
h) PF Commissioner A/c	610,840	0	447,360	0
i) P.F.New Pension Scheme	277,199	0	88,027	0
j) State Profession Tax	24,100	0	24,175	0
k) Income tax (salary)	671,389	4,950,432	402,780	3,575,325
6. Other current Liabilities(Various Consultancies)	651,354	0	0	584,354
Self Contribution - P.F.	0	651,354	-	0
7. Unspent Balance of Grant	51,608,362	0	0	43,844,570
8. Earnest Money Deposit for Construction and Equipments	1,856,254	0	1,793,534	0
9. Security deposit	1,163,996	0	1,113,469	0
10. Other Tution Fees	34,002	0	28,898	0
11. Recovery of Bank Loan	21,365	0	52,390	0
12. DST PAC Meeting	163,610	0	163,610	0
13. FIST Programme	546,809	0	546,809	0
14. DST Straigernt Meeting	58,406	0	58,406	0
15. DST Solar Meeting	128,254	0	128,254	0
16. HCJMRI Project (Unspent Balance)	27,524	0	27,524	0
17. Doodhpapeshwar Ltd. Project	18,031	0	29,049	0
18. Organizing Group Meeting &Monitoring Committee	540	0	540	0
19. DST Good Lab Practice Seminar	51,860	0	51,860	0
20. Scheme	9,003,065	0	0	0
21. Beej Infrastructure Facility	0	0	750,000	0
22. Retention Money	152,967	0	179,489	0
23. Organising Meeting of Task Force	400,000	0	0	0
24. Technology Transfer - Robonik India Pvt.Ltd.	1,000,000	66,235,045	0	4,923,832
Total (A)	**72,346,476**	**0**	**0**	**53,448,471**

Particulars	Current Year		Previous Year	
B. PROVISIONS				
1. For Taxation	0	0	0	0
2. Gratuity	54,860,953	0	0	51,164,369
3. Superannuation/Pension	0	0	0	0
4. Accumulated Leave Encashment	35,819,329	0	0	32,924,576
5. Trade Warranties/Claims	0	0	0	0
6. Others	0	0	0	0
- Salary for March 2013	3,946,439	0	3,813,228	0
- Audit Fees	16,854	0	16,854	0
- Seminar Expenses	0	0	2,000	0
- Electricity & Power	436,850	0	421,080	0
- Postage & Telephone	34,922	0	40,638	0
- Vehicle Maintenance	0	0	11,361	0
- Campus Maintenance	114,532	0	86,169	0
- Legal Fees	0	0	24,000	0
- Traveling Expenses	0	0	22,706	0
- Security Service Charges	82,814	0	91,737	0
- Honararium	0	0	20,000	0
- Water Charges	165,528	0	-	0
- Database Expenses	0	0	217,855	0
- Information & Technology Services	50,000	0	-	0
- Medical Expenses	61,659	0	62,968	0
- Advertisement	3,503	0	-	0
- Subscription to Journals	13,100	0	98,162	0
- Purchases	31,018	0	331,377	0
- Science Day Expenses	0	0	5,618	0
- Reimbursement of Tuition fee	88,567	0	30,520	0
- Liveries	0	0	41,160	0
- Farm Expenses	0	0	130,548	0
- Hired Labour Charges	467,077	0	184,968	0
- Service Contract (Repairs & Maintenance)	26,423	0	15,150	0
- Deposit Linkied Insurance Fund	2,600	0	2,895	0
- Leave Travel Concession	0	0	2,788	0
- Reimbursement of Medical Expenses of Retired Staff Members	34,679	0	17,429	0
- P.F. & N.P.S.	521,465	0	439,594	0
- P.F. & N.P.S. Adm. Charges	47,832	0	36,414	0
- Stipend	11,000	0	0	0
- Reimbursement of Telephone Expenses	11,758	0	44,240	6,211,459
- Provision for Books	18,664	96,867,566	0	0
- ARI Staff TDS Refundable	0	8,381	0	8,381
Total (B)	**0**	**96,875,947**	**0**	**90,308,785**
Total (A+B)	**0**	**169,222,423**	**0**	**143,757,256**

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

Schedules forming part of Balance Sheet as at 31.03.2013

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	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	0		174,914	0				0	174,914	174,914
b) Leasehold	0	Nil	0		0	0				0	0	
2. BUILDINGS:			0									
a) On Freehold	62,682,830	2.5%	1,456,792		64,139,622	10,906,053	1,567,071	36,420	1,603,491	12,509,544	51,630,078	36,512,722
b) On Leasehold	0	Nil	0		0	0	0	0	0	0	0	
c) Ownership Flats/Premises	0		0		0	0	0	0	0	0	0	
d) Superstructures on Land and not belonging to the entity	0	Nil	0		0	0	0	0	0	0	0	
					0		0	0	0	0	0	
e) Temporary Structures	1,727,873	2.5%	213,584		1,941,457	481,536	43,197	5,340	48,536	530,072	1,411,385	1,289,534
f) Shed and glasshouse at Hol	628	2.'5%	0		628	627	0	0	0	627	1	15
3. PLANT MACHINERY & EQUIPMENT					0			0	0	0		
a) Equipment at Hol	54,578	10%	0		54,578	54,578	0	0	0	54,578	0	1
b) Equipments at Pune	187,551,828	20%	10,474,347		198,026,175	182,471,786	1	2,094,869	2,094,870	184,566,656	13,459,519	2,175,298
4. VEHICLES	1,791,407	20%	0		1,791,407	1,791,407	0	0	0	1,791,407	0	1
5. FURNITURE, FIXTURES	12,702,852	10%	341,969		13,044,821	12,699,934	1	34,197	34,198	12,734,132	310,689	891,207
MODULAR FURNITURE-NEW LAB	7,810,160	10%	429,604		8,239,764	781,016	1	42,960	42,961	823,977	7,415,787	0
6. COMPUTER/PERIPHERALS	10,471,437	20%	136,226		10,607,663	9,756,556	1	27,245	27,246	9,783,802	823,861	242,811
7. ELECTRIC INSTALLATIONS	2,983,737	10%	0		2,983,737	2,776,698	1	0	1	2,776,699	207,038	505,413
8. TRANSFORMER	1,491,549	15%	0		1,491,549	1,491,549	0	0	0	1,491,549	0	1
9. LIBRARY BOOKS	6,302,043	20%	567,814	9,102	6,860,755	5,944,811	1	111,742	111,743	6,056,554	804,201	327,411
10. TUBEWELLS & W. SUPPLY	112,538	2.5%	0		112,538	67,057	2,813	0	2,813	69,870	42,668	48,294
11. SOLAR SYSTEM HOSTEL	167,379	10%	0		167,379	93,237	16,738	0	16,738	109,975	57,404	1
12. OTHER FIXED ASSETS	5,399,852	2.5%	0		5,399,852	1,220,677	134,996	0	134,996	1,355,673	4,044,179	4,314,171
13. RE-CARPATING OF EXISTING ROADS		2.50%	1,862,736		1,862,736	0	0	46,568	46,568	46,568	1,816,168	0
14. CONST.OF H.T. SUBSTATION	4,795,851	2.5%	532,291		5,328,142	238,892	119,896	13,307	133,204	372,096	4,956,046	4,640,855
TOTAL OF CURRENT 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**
PREVIOUS YEAR	**268,777,794**		**8,035,266**	**63**	**276,812,997**	**221,226,532**	**2,258,604**	**1,102,606**	**4,463,815**	**225,690,347**	**5,122,649**	**47,551,202**
TOTAL	**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**

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 31.03.2013

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	
5. Subsidiaries and Joint Ventures		
6. Others (Fixed Deposits) (Dr. A.D.Agate Donation)	5,001	5,176
7. Others (Fixed Deposits from Technology Development Fund A/c:SBI & UBI)	40,246,584	31,544,727
8. Others(Fixed Depositwith Union Bank of India) (includes accrued interest)	61,274,840	40,436,907
TOTAL	**101,776,425**	**71,986,810**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Balance Sheet as at 31.03.2013

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 31.03.2013

Schedule 11 : Current Assets, Loans & Advances

Amount - Rs.

Particulars	Current Year		Previous Year	
A. CURRENT ASSETS:				
1. Inventories:				
a) Stores and Spares				
b) Publications	23,919		26,577	
c) Stock-in-trade of consumables(as taken valued and certified by the Management)	151,000	174,919	81,482	108,059
2. Sundry Debtors: Toshvin Analytical	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	217,898
3. Cash balances in hand(including cheques/drafts and imprest)	5,929	226,152		24,299

Particulars	Current Year		Previous Year	
4. Bank Balances:				
a) With scheduled Banks				
- On Current Accounts	10,249,375		10,373,025	
- On Deposit Accounts(CLTD A/c)		-		
- On Savings Accounts	10,275,619		17,641,837	
- On Savings Accounts(TDF)		20,524,994	756,468	28,771,330
b) With non-Scheduled Banks:		-		
- On Current Accounts		-		
- On Deposit Accounts		-		
- On Savings Accounts		-		
5. F.D. Against L/C.	6,299,375			1,421,919
6. Dr. Acharya	181			181
7. Amount receivable from Schemes		6,299,556		4,816,310
TOTAL (A)		**27,225,621**		**35,359,996**
B. LOANS,ADVANCES AND OTHER ASSETS				
1. Loans:				
a) Staff (For HBA, Vehicle Advance and Computer)	1,820,947			1,179,824
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)	2,819,968	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	23,305,876		18,550,888	
b) Prepayments(Cash Insurance)	1,092		1,164	
c) Advances to staff (For TA etc)	2,261,655		728,957	
d) Prepaid Medical Insurance Premium	145,087		48,620	
e) Festival Advance	375		-	
f) Prepaid subscriptions for journals	2,845,648		5,682,049	
g) Deposits kept with third parties	824,941	29,384,674	824,941	25,836,619
3. Income Accrued:				
a) On Investments from Earmarked/Endowment Funds	5,935	-		-
c) On Loans and Advances(HBA & Vehicle Adv)	-		-	
d) Accured int on Technology Dev Fund Account	2,501,344			
e) Amount receivable from INDO-TUNISIA	56,400			56,400
f) Interest on F.D.R. - Union Bank of India	1,415,136		11,506	
4. Claims Receivable (TDS)	448,301		439,920	
5. Amount Receivable - Adv. given to MEF Scheme Staff			-	
6. Overhead Charges receivable				
7. Kumar Krishi Mitra Fellowship	31,281		31,281	
8. Royalty Receivable	10,000		10,000	
9. Vigyan Prasar		-		
10. Amount Receivable from MACS	111,613	4,580,010	503,767	996,474
11. Amount receivable for Parliamentary Standing Committee Expenses		311,313		
TOTAL (B)		**39,185,513**		**28,069,317**
TOTAL (A+B)		**66,411,134**		**63,429,313**

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

Income and Expenditure Account for The Year Ended 31.03.2013

Amount - Rs.

Particulars	Schedule	Current Year	Previous Year
Income			
Income from Sales/Services	12	1,112,783	595,115
Grants/Subsidies	13	137,236,208	136,411,601
Fees/Subscriptions	14	82,213	236,803
Income from Investments(Income on Invest. From earmarked/ endowment Funds transferred to Funds)	15	-	-
Income from Royalty, Publications etc.	16	57,605	54,484
Interest Earned	17	7,314,339	2,456,841
Other Income	18	305,140	363,943
Increase/(decrease) in stock of Laboratory consumables	19	66,860	4,225
Donation Received in kind (Equipment)		-	120,183
Total (A)		**146,175,148**	**140,243,195**
Expenditure			
Establishment Expenses	20	91,071,800	87,897,859
Other Administrative Expenses etc.	21	37,674,231	21,759,712
Expenditure on Grants, Subsidies etc.	22	-	-
Interest	23	-	-
Depreciation (Net Total at the year-end- corresponding to schedule 8)	8	4,297,367	5,086,066
Total (B)		**133,043,398**	**114,743,637**
Balance being excess of Income over Expenditure (A-B)		13,131,750	25,499,558
Transfer to Trust fund (for capital expenditure Schedule D)	39,321,239	49,515,527	
BALANCE BEING SURPLUS/(DEFICIT)CARRIED TO		39,321,239	49,515,527
CORPUS/CAPITAL FUND		**(26,189,489)**	**24,015,969**
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/-
Sqn. Ldr. S. Francis (Retd)
Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

23rd September, 2013

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

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 12 : Income from Sales/Services

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Sales		
a) Sales of Finished Goods (Farm Produce)	1,111,687	594,525
b) Sale of Raw Material	-	
c) Sale of Scraps	250	-
2. Income from Services		
a) Service Charges	710	580
b) SEM Charges		-
c) Maintenance Services (Equipment/Property)		-
d) Others (Currency Fluctuation Adjustment)		-
e) Fees for Information (Right to Information Act)	136	10
Total (Rs.)	**1,112,783**	**595,115**

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

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 13 : Grants/Subsidies

Amount - Rs.

Particulars	Current Year	Previous Year
1. Central Government	145,000,000	136,300,000
Add: Unspent balance at the beginning of the year	43,844,570	43,956,171
Less: Unspent balance at the year end	51,608,362	43,844,570
	137,236,208	**136,411,601**
2. State Government	-	-
3. Government Agencies	-	-
4. Institutions/Welfare Bodies	-	-
5. International Organisations		-
6. Others (Specify)	-	-
Net Surplus of sale of Assets		
Total (Rs.)	**137,236,208**	**136,411,601**

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

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 14 : Fees/Subscriptions

Amount - Rs.

Particulars	Current Year	Previous Year
1. Entrance Fees (Library Membership fees)	11,902	34,310
2. Annual Fees(Licence fees)/Subscriptions	13,877	12,346
3. Seminar/Program Fees	-	-
4. Others (Ph.D.Tuition fee, Ph..D.Provisional Admission fee)	56,434	190,147
Total (Rs.)	**82,213**	**236,803**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

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 31.03.2013

Schedule 16 : Income from Royalty, Publication etc.

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Royalty	-	-
2. Income from Publications	7,655	7,084
3. Others (Sale of Tender Forms/I Cards)	23,550	30,600
4. Application Money	26,400	16,800
Total (Rs.)	**57,605**	**54,484**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 17 : Interest Earned

Amount - Rs.

Particulars	Current Year	Previous Year
1. On Term Deposits		
a) With Scheduled Banks	-	-
b) With Non-Scheduled Banks	6,230,492	1,528,666
c) With Institutions		-
2. On Saving Accounts	908,275	832,800
a) With Scheduled Banks		
b) With Non-Scheduled Banks		
c) Post Office Savings Accounts		
d) Others M.S.E.B Deposit		31,413
3. On Loans		
a) Employees/Staff (On HBA, Vehicle and Computer Advance)	175,572	63,962
b) Others (Interest on LTC Advance)		-
4. Interest on Debtors and Other Receivables		-
Total (Rs.)	**7,314,339**	**2,456,841**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

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)	-	55,501
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	11,790	5,304
5) Lab Space Usage Charge		-
6) Guest House Receipts	21,486	23,888
7) Hostel Fees Received	26,125	31,925
9) Medical Scheme for Retired staff	76,500	244,800
10) Late Fee for Ph.D. Tuition Fee	2,400	2,525
11) Laboratory Fees	8,000	
12) F.D. Against L.C.	143,839	-
Total (Rs.)	**305,140**	**363,943**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

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

Amount - Rs.

Particulars	Current Year	Previous Year
a) Closing Stock		
- Laboratory Consumables	151,000	81,482
- Finished Goods		
- Publications	23,919	26,577
	174,919	108,059
b) Less: Opening Stock		
- Laboratory Consumables	81,482	77,257
- Finished Goods		
- Publications	26,577	26,577
	108,059	103,834
Net Increase/(Decrease)	**66,860**	**4,225**

M.A.C.S's Agharkar Research Institute, Pune - 411 004
Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 20 : Establishment Expenses

Amount - Rs.

Particulars	Current Year	Previous Year
1) Salaries and Wages	65,538,626	60,963,759
2) Allowances and Bonus	169,821	225,373
3) Contribution to Provident Fund & New Pension Scheme	5,984,476	6,266,572
4) Contribution to Other Fund (D.L.I.F.)	32,426	38,036
5) Staff Welfare Expenses	3,443,044	1,828,853
6) Expenses on Employees Retirement and Terminal Benefits	10,135,204	11,885,098
7) Stipend to Trainees	3,193,473	3,456,364
10) Encashment of Earned Leave for LTC	282,889	409,888
11) Reimbursement of Residential Telephone Expenses	184,213	198,639
13) Fellowship & Research Associateship	1,648,340	2,158,984
14) P.F. and N.P.S. Admn.Charges	459,288	466,293
	91,071,800	**87,897,859**

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

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 21 : Other Administrative Expenses

Amount - Rs.

Particulars	Current Year	Previous Year
ADVERTISEMENT & PUBLICITY	253,012	44,962
AUDITORS REMUNERATION	16,854	21,854
BANK CHARGES	13,082	9,852
CAMPUS MAINT. EXPS	1,054,321	798,071
CONSULTANTS ENGINEERS HONORARIUM	84,839	206,000
CASH INSURANCE	3,628	3,190
ELECTRICITY & POWER	5,200,310	4,596,868
FARM EXPS	1,151,335	833,921
FIELD TOUR	347,696	80,925
GARDEN EXPS	204,508	6,123
HONORARIUM	178,500	241,500
HOSPITALITY EXPS	218,636	114,284
INFORMATION TECH & NETWORKING	942,082	945,513
LABOUR & PROCESSING EXPS	546,987	168,998
LEGAL FEES	-	89,000
LIB MISC EXPS	41,753	28,875
LIVERIES	35,799	47,109
HIRED LABOUR CHARGES	2,971,099	2,935,366
NATIONAL TECHNOLOGY DAY EXPENSES	2,890	
RECOGNITION FEE	-	12,000
RENEWAL OF RECOGNITION FEE	72,000	-
OFFICE EXPS MISC	73,964	71,549
PATENT RENEWAL CHARGES	34,000	12,800
POSTAGE, TELEPHONE & COMMUNICATION CHARGES	319,110	270,587
PRINTING & STATIONERY	792,363	652,025
PROFESSIONAL FEES	81,379	26,677
PROF S P AGHARKAR DAY EXPS	123,148	12,030
PROPERTY TAX	1,894,296	343,550
PURCHASES OF CHEMICALS & GLASSWARE	5,820,672	3,324,603
REPAIRS AND MAINTANANCE	3,470,937	1,642,903
HINDI DAY EXPENSES	10,288	800
SCIENCE DAY EXPS	119,501	63,564
SECURITY SERVICE CHARGES	1,150,503	1,097,509
SEM CHARGES	9,900	-
SEMINAR EXPS	37,160	22,344
SUBSCRIPTION EXPS	7,400,629	241,520
TA/CONVEYANCE-INDIAN AND FOREIGN TOUR	796,407	478,299
VIGILANCE WEEK EXPS.	420	1,560
VEHICLE RUNNING AND MAINT EXPS	196,305	129,433
WATER CHARGES	810,084	1,155,295
DATA BASE EXPENSES	1,179,234	1,025,603
MEMBERSHIP FEE	14,600	2,650
TOTAL (Rs.)	**37,674,231**	**21,759,712**

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

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 22 : Expenditure on Grants, Subsidies etc.

Amount - Rs.

Particulars	Current Year		Previous Year	
a) Grants given to Institutions/Organisations	0.00	0.00	0.00	0.00
b) Subsidies given to Institutions/Organisations	0.00	0.00	0.00	0.00
TOTAL		**0.00**		**0.00**

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

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

Schedules forming part of Income and Expenditure Account for the year ended 31.03.2013

Schedule 23 : Interest

Amount - Rs.

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

For Schedule 1 to 23

As per our report of even date

For **MARATHE PADHYE & ATHALYE,**

Chartered Accountants

Sd/-
Sqn. Ldr. S. Francis (Retd)
Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

23rd September, 2013

FORM OF FINANCIAL STATEMENTS : Non- profit making organization
NAME OF ENTITY : MACS'S Agharkar Research Institute Pune, 411004
Schedules forming part of The Accounts for the period ended 31st March 2013

Schedule 24 : Significant Accounting Policies

a. Accounting convention :

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

b. Fixed Assets:

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

c. Method Of Depreciation:

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

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

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

On the basis of information and explanation given by the Management Extra-Ordinary Items, Prior Period Items, Changes in Accounting Policies are not separately disclosed in the Financial Statement but are integrated through various items appearing under the same.

e. Foreign Currency Transactions:

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

f. Investment :

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

g. Revenue Recognition:

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

h. Accounting for Government Grants :

1. Government grants of the nature of contribution towards capital cost of setting up projects as capital reserve.
2. Grant in respect of specific assets acquired are shown as a deduction from the cost of related assets.
3. Government grants/subsidies are generally accounted on accrual basis.
4. Government grants are given for seminars are in revenue nature revenue nature but directly taken to Current asset and expenditure is booked against it so as to determine shortage or excess if any.

i. Retirement Benefits :

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

j. Capitalisation:

All direct expenses attributable to fixed asset acquired are capitalised.

As per our report of even date

For **MARATHE PADHYE & ATHALYE,**

Chartered Accountants

Sd/-	Sd/-	Sd/-
Sqn. Ldr. S. Francis (Retd)	**K.M. Paknikar**	Partner
Finance & Accounts Officer	Officating Director	23rd September, 2013
ARI	ARI	

FORM OF FINANCIAL STATEMENTS : Non- profit making organization
NAME OF ENTITY : MACS'S Agharkar Research Institute Pune, 411004
Schedules forming part of The Accounts for the period ended 31st March 2013

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

1. Contingent liability :

a) Claims against the entity not acknowledge as debts-Nil (Previous Year-Nil)

b) In respect of:

- Bank guarantee given by on behalf of the entity -N.A.(Previous Year-Nil)
- Letters of credit opened by bank behalf of the entity -.Nil(Previous Year-Rs.Nil)
- Bill discounted with banks-Nil(PreviousYear-Nil)

c) Disputed demands in respect of :

- Income tax -Nil (previous Year-Nil) Sales tax -Nil (Previous Year-Nil)
- Municipal Taxes -Nil (Previous Year-Nil)

d) In respect of claims from parties for non-execution of orders, but contested by the entity - Nil (Previous Year-Nil)

2. Capital Commitments:

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

3. Lease obligation

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

4. Currants Asset, Loans And Advances:

In the opinion of the management, the current assets, loans and advances have a value on realization in the ordinary course of business, equal to the aggregate amount shown in the Balance Sheet. Some of balance of sundry debtors, deposits, loans and advances are subject to confirmation from the respective parties and consequential reconciliation/adjustments arising there from, if any. Advances of ~Rs.3.52 Lacs paid to clearing house agent Mls. Fly jack Logistics is not likely to be received/settle as the said party is not accepting the dues. Except to this management doesn't expect any material variation.

5. Taxation

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

6. Grants:

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

7. Retirement Benefit:

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

The principle assumptions used in determining the gratuity obligations are as below: -

Sr. No.	Particulars	For year ended 31st March, 2013
1.	Withdrawal Rate	2.00%
2.	Discounting Rate	8.50%
3.	Future Salary Rate	5.00%

The position of gratuity payable on death/retirement of employees and leave encashment as on 31st March, 2013 is as below:

Particulars	Provision for Gratuity	Provision for Leave Encashment
Opening balance as on 31st March 2012	5,11,64,369	3,29,24,576
Add:-Addition during the year 2012-13.	36,96,584	28,94,753
Less:-Deduction during the year 2012-13.	-	-
Closing Balance as on 31st March 2013.	5,48,60,953	3,58,19,329

8. Impairment of Assets:

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

9. During the year 2008-2009, a scanning Electron Microscope amounting to Rs. 89.00 lacswas purchased for ARI, common facility, which was not yet installed and made operative. This clearly has major financial implication and may delay the future cash inflow generation from the said Equipment.

10. Previous year figure are rearranged, recast or regrouped wherever necessary, to make them comparable which those of the year under audit.

11. Third party confirmation are necessary for confirming the balances appearing in the books of account and also long outstanding of balances as at the Balance Sheet date, but institute was not able to provide any of such confirmation to us. Hence, we are unable to comment on the accuracy of such third party balances.

12. Provisions are recognised when the firm has present obligation as a result of past event; it is more likely that an outflow resources will be required to settle the obligation; and the amount has been reliably estimated.

13. Opening Inter balances of ARI-MACS -SCHEMES are not matching. Also during the year transactions are not matching. No reply has been received from the Institute in this regard.

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

As per our report of even date

For **MARATHE PADHYE & ATHALYE,**
Chartered Accountants

Sd/-
Sqn. Ldr. S. Francis (Retd)
Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

23rd September, 2013

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

Schedules forming part of Balance Sheet as at 31.03.2013

Schedule D

Amount - Rs.

Particulars	Current Year		Previous Year	
Other Fixed Assets				
Temporaty Structures	213,584			
Modular furniture for New Lab Bldg	429,604		7,810,160	
Books	567,814		165,381	
Construction of Buildings	1,456,792		16,831,126	
Computer / Peripherials / Softwares	136,226		590,089	
Electric Fittings	-		-	
Office Furniture & Dead Stock	341,969		381,996	
Other Fixed Assets	-			
Construction of HT Substation	532,291		36,000	
App. & Equipments	10474347		5059008	
Recarpeting of Existing Roads	1862736			
Solar Systems			90879	
		16,015,363		**30,964,639**
Advance to Supplier for Equipments				
A D Instruments	-		(5,230)	
Freight Express	158,349		158,349	
Inkroma	1,809,600		1,809,600	
Mapple ESM Technologies Ltd.	121,500		121,500	
New Brunswick Sci Co	1,000		1,000	
. Licer Inc.	3,822,990		3,822,990	
Applied Separations Inc.	2,113,139		2,113,139	
Bharat Chemicals	5,027		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			1,059,057	
Carl Zeiss	6,234,768		6,234,768	
CPWD	1,761,009			
Director TMC Actrec	1,500		1,500	
Dr.B.V.Rao IPMT	7,288		7,288	

Particulars	Current Year		Previous Year	
Easy Comp Solutions	11,250		11,250	
FlyJac Logistics	352,516		352,516	
Girikand Travel	36,869		36,869	
Growtech	124,440		124,440	
Heidolph Instruments GmbH & Co.	276,710			
Jeico Tech Co.Ltd.	905,048			
National Botanical Res.Institute	4,613		4,613	
Nikon Corporation	712,223			
Oxford Instruments Analyticals	1,310,418		1,310,418	
PSP Freight Lines Pvt.Ltd.	151,405		151,405	
Precious Scientific &Surgicals	2,750		2,750	
Raut Scientific & Surgicals	10,904		10,904	
Schindler India Ltd.			831,300	
Sine Waves Computer services	8,320		8,320	
Shri Sai Traders	800		800	
Sigma Aldrich Chemicals	14,710		34,099	
Vijay Chemicals	25,843		25,843	
Ratanmohan	2,866		2,866	
Khadi Gramodyog Seva	15,218		15,218	-
Sunad Services			(384)	18,550,888
		23,305,876		
TOTAL		**39,321,239**		**49,515,527**

As per our report of even date

For **MARATHE PADHYE & ATHALYE,**

Chartered Accountants

Sd/-
Sqn. Ldr. S. Francis (Retd)
Finance & Accounts Officer
ARI

Sd/-
K.M. Paknikar
Officating Director
ARI

Sd/-
Partner

23rd September, 2013

National Science Day

Farmer's Mela, Hol farm, 25 February 2013

Around 100 farmers participated in the discussions regarding cultivation practices. Dr DR Bapat, Dr SC Misra, Dr SP Taware, Dr BK Honrao and Dr S Tetali interacted with the farmers.

Maharashtra Association for the Cultivation of Science
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