

# BIOTECH EXPRESS



## Event Report:

Post Event report of  
19th convention of BRSI

The Vial: India's  
COVID-19 Vaccine Story  
available on youtube

## Guestorial:

Melatonin: A molecule  
endowed with a multitude of  
functions in animals and  
plants

## Giant Viruses

Fish Genomics:  
Present Status,  
Applications and  
Future Challenges

## Editorial: Recent Achievements of India's top Biotechnologist Prof Ashok Pandey and his society BRSI

Dr Jitendra Singh announces  
an exclusive women's portal  
for research grants and funds  
from 1st of April 2023

President Murmu  
appreciates ICAR-  
NBFGR

Telangana Govt to push  
pharma, biotech start-ups,  
after making it big in IT



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# BIOTECH EXPRESS

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From the very first issue, Biotech Express team has been delivering what's best for Biosciences community. The audience of this magazine includes students, researchers, faculties and executives of highly prestigious organizations of India. In year 2016, BEM has made new editorial Board combining experience of eminent Advisory Board Members who have been into Award winning Research and head of prestigious Administrative positions.

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## Editorial

by Kamal Pratap Singh



# Professor Ashok Pandey, elected as Fellow of The World Academy of Sciences and became highest cited researcher in India

**P**rofessor Ashok Pandey, Distinguished Scientist, CSIR-Indian Institute of Toxicology Research, Lucknow has the unique distinction of being ranked #1 in India and #8 in the world in Biotechnology by the Stanford University, USA, based on its survey conducted and published in November 2020 on global ranking of researchers in different domains of Science and Technology. He has been rated among the Top 1% Highest Cited Researcher in the world since 2018 every year by the Clarivate Analytics, Web of Science.

Professor Pandey has the unique distinction of being

ranked #1 in India and #8 in the world in Biotechnology by the Stanford University, USA, based on its survey conducted and published in November 2020 on global ranking of researchers in different domains of Science and Technology. He has been rated among the Top 1% Highest Cited Researcher in the world since 2018 every year by the Clarivate Analytics, Web of Science.

Recently Professor Pandey has been elected as FELLOW of The World Academy of Sciences (TWAS), the UNESCO organization. TWAS has referred Professor Pandey as a world authority on bioprocess technology, especially on industrial enzymes and biofuels—a

programme on alternative fuels started by him in CSIR over about 20 years ago for energy and environmental sustainability. He created a niche for bioprocess technology research and development in India for the production of industrially important products on the principles of waste to wealth. On five keywords of his works (bioconversion of biomass, industrial fermentation, solid-state fermentation, industrial enzymes, lignocellulosic bioethanol), his name appears as top researcher in the world (according to SCOPUS search). This is a rare distinction achieved by only a very few Indians.

Professor Ashok Pandey has not only achieved a distinct footing among Indian scientists and academicians by reaching more than 70,000 citations (Google scholar) but also has a significant global standing. He is the highest cited researcher in India in the fields of biological sciences and energy & environmental sciences. Also, his h index is currently 127, which is the highest for an Indian researcher in the above areas.

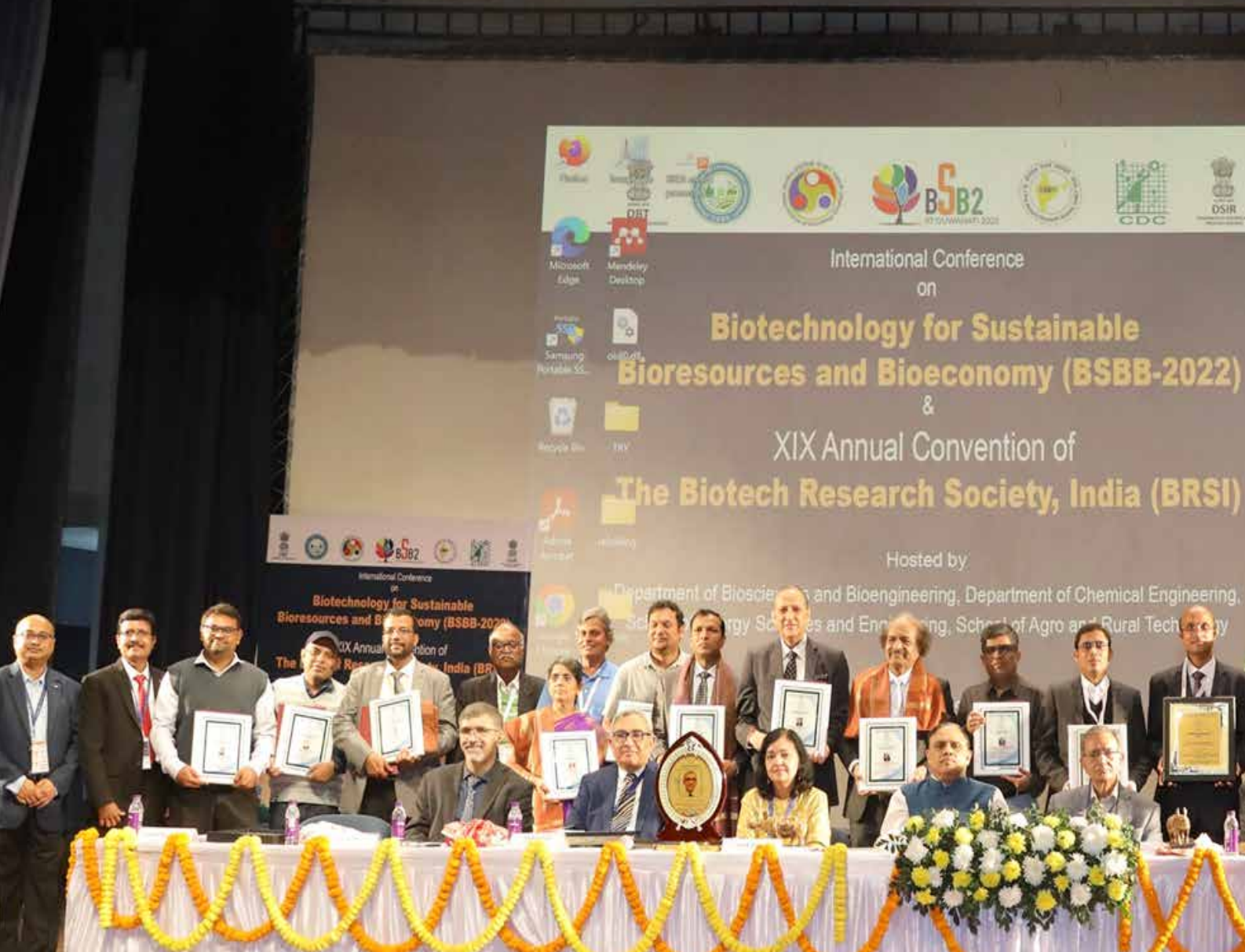
A citation is a way of giving credit to individuals for their creative and intellectual works that are used by the authors from all over the world to support their research. It can also be used to locate the particular source which helps in plummeting plagiarism. Citing or documenting the sources used in the research serves purposes such as it allows the researchers to give due credit to the authors of the work or ideas which is incorporated by them into their paper and also allows those who are reading your work to locate your sources.

Professor Pandey has been a Highly Cited Researcher since 2018, among Top 1% researchers from all over the world according to the annual reports of Clarivate Analytics, Web of Science. Various other agencies too have found him among the top researchers in the world such as Research.Com in 2022 rated him Rank #1 in India in Biology and Biochemistry; Elsevier Citation Report (2021) rated him Rank #1 in India in Microbiology under Enabling and Strategic Technologies sector and No 4 in overall in science and engineering; Stanford University USA Citation Report rated him Rank #1 in India in Biotechnology and #8 in

the world, since 2020 in its annual reports and Highly Cited Researchers (h>100) by Google Scholar Citations, 14th & 15th Edition, BETA list (2021, 2022).

Professor Pandey has been a great visionary. With deep thoughts and plans, it is he who established the Biotech Research Society, India (BRSI; www.brsi.in) in 2003. BRSI offers an interdisciplinary platform for the researchers and industries as well as to policy planners bringing experts from biotechnology, biochemistry, microbiology, chemical and biochemical engineering, environmental science and engineering and also from other areas of life sciences and biological engineering.

Professor Pandey is the recipient of many national and international awards and honours, which include Highest Cited Researcher (Top 1% in the world), Clarivate Analytics, Web of Science (2020, 2019 & 2018); Top scientist in Biotechnology (no. 1 in India and no. 8 in the world), Stanford University world ranking (2020); Fellow, World Society of Sustainable Energy Technologies (2020); Fellow, Indian Chemical Society (2020); Distinguished Scientist, IconSWM Life-time Achievement Award 2019, International Society for Solid Waste Management, KIIT, Bhubaneswar, India (2019); Yonsei Outstanding Scholar, Yonsei University, Seoul, Korea (2019); Life-Time Achievement Award from the Biotech Research Society, India (2018); Life-Time Achievement Award from Venus International Research Awards (2018), Most Outstanding Researcher Award from Career360 (2018), Life-Time Achievement Award from the International Society for Energy, Environment and Sustainability (2017); Fellow, Royal Society of Biology, UK (2016); Fellow, International Society for Energy, Environment and Sustainability (2016); Academician of European Academy of Sciences and Arts, Austria (2015); Fellow, National Academy of Sciences, India (2012); Fellow, Association of Microbiologists of India (2008); Honorary Doctorate degree from Universite Blaise Pascal, France (2007); Fellow, International Organization of Biotechnology and Bioengineering (2007); Thomson Scientific India Citation Laureate Award, USA (2006); Fellow, the Biotech Research Society, India (2005); UNESCO Professor (2000), etc.



## Post Event report - XIX Convention of Biotech Research Society, India (BRSI)

International Conference on Biotechnology for Sustainable Bioresources and Bioeconomy (BSBB-2022) & XI Convention of Biotech Research Society, India (BRSI) was held on 7th-11th December 2022 at Indian Institute of Technology, Guwahati, India. BSBB-2022 was organized by the Department of Biosciences and Bioengineering, Department of Chemical Engineering, School of Argo and Rural Technology and School of Energy Sciences and Engineering, IIT Guwahati in association with the BRSI. The conference was sponsored by the Department of Scientific and Industrial Research, Govt of India, New Delhi; Department of Biotechnology, Govt of India, New Delhi; Centre for Energy and Environmental Sustainability, India; Centre for Development Communication, Jaipur, India; Elsevier & Taylor & Francis.



## Key highlights of the BRSI Conference

- More than >500 registered delegates in physical mode
- Participation from 38 countries, including India
- Five Parallel Technical Sessions and Twelve Scientific Sessions for three days
- Fifteen Plenary Lectures (PL) and 125 Invited Lectures (IL)
- Two Technical Workshops- “Art of Scientific Writing” and Taylor and Francis Workshop
- One Public Lecture
- BRSI Award Lectures
- Contributory Talks: 35 Short Oral Talks and 268 Flash Talks
- Presentations of 278 Posters
- Industry Young Researcher Interaction
- Visit to II & SI on 11th Dec 2022
- Eight special issues in Scientific Journals



**A**pplication of Biotechnology in Bioresources protection, its sustainable management and towards Bioeconomy development has led to an information explosion and knowledge boom in all disciplines. Tools of Biotechnology are routinely used in areas of agriculture, energy, environmental but have many other applications in basic healthcare research and industrial

use too. Common applications of Biotechnology include antibiotic production, vaccine development, downstream processing and bio-mass production of valuable products of importance in pharma sector. Given the growing importance and relevance of Biotechnology primarily for Sustainable development and protection of bioresources keeping in lieu of key Sustainable Developments Goals, Indian students and researches from dif-

ferent academic backgrounds need to be aware of this cutting edge technology. BSBB-2022 aimed:

- To effectively address and disseminate information on frontier areas of biotechnology amongst the scientific community, universities and industries and to provide an overview of different applications. The goal was to also to bridge the gap between scientific community of Ne India with rest of the country



- To bring together students, researchers, and scientists in technical institutes / academics of North Eastern States, and other parts of India. Participation was also being welcomed from private institutions, colleges, administrators, hospitals etc.

- To sensitize about the importance of Biotechnology for sustainable development and bioresources protection and its utilization and also the necessity of having a focal centre for building key facility ca-

tering to the needs of NE states.

The Inaugural session flagged off on 7th Dec 2022 and was graced by Prof. Dr. T. G. Sitharam, Director, Indian Institute of Technology, Guwahati, India; Prof. Ashok Pandey, Chief Mentor- BRSI, CSIR-IITR, Lucknow, India; Prof. S K Sopory, President-BRSI, ICGEB, New Delhi, India; Prof. Tej P Singh, AIIMS, New Delhi, India; Prof Mohammad Taherzadeh, University of Boras, Sweden; Prof Byong-Hun Jeon, Hanyang University, Seoul,

South Korea; Prof Samir K Khanal, General Secretary-IBA, University of Hawaii, Honolulu, USA; Prof. Sunil K Khare, Vice-President- BRSI, IIT, New Delhi, India; Prof Latha Rangan, Convener, IIT Guwahati and Prof Kaustubha Mohanty, Convener, IIT Guwahati.

During the Inaugural session, BRE3CH special issue of Indian Journal of Experimental Biology and the abstract book of the BSBB-2022 was released, which contained messages from Director

## BEST PAPER AWARDS: BSBB-2022

### Short Oral and Flash Presentations and Posters

<b>Award Category</b>	<b>Name and Affiliation</b>
Shree Lok Bahadur Khanal Memorial Educational Foundation Best Poster Presentation Award	Poonam Kumari, CSIR-Indian Institute of Chemical Technology, Hyderabad
Shree Lok Bahadur Khanal Memorial Educational Foundation Best Flash Presentation & Poster Award	Akshita Kanwar, Indian Institute of Technology, Guwahati
	Monalisha Mishra, Motilal Nehru National Institute of Technology Allahabad
	Saniya Zaidi, Indian Institute of Technology, Delhi
	Sushmita Das, Institute of Advanced Study in Science & Technology, Guwahati
	Ramandeep Kaur, CSIR-Indian Institute of Petroleum, Dehradun
Centre for Energy and Environmental Sustainability (CEES), India Best Oral Presentation Award	Lohitkumar Srinivas Gujjala, Kyung Heeuniversity, Republic of Korea
	Thomas Kiran Marella, Mobioltechnologies Corporation, Tsukuba, Japan
Centre For Energy and Environmental Sustainability (CEES), India Best Flash Presentation & Poster Award	Jiao Minna, Northwest A&F University, China
	Nuzelu, Indian Institute of Technology, Guwahati
	Susovan Patra, Vidyasagar University, Midnapore
	Rajendra Prasad Sahu, Indian Institute of Technology, Kharagpur
	Vipin Krishnan S, CSIR-National Institute for Interdisciplinary Science And Technology, Trivandrum
	Suryateja Pottipati, Indian Institute of Technology, Guwahati
	Harisankar S, Indian Institute of Technology, Madras
	Deeksha Gopaliya, Indian Institute of Technology, Delhi
BSBB-2022 Best Oral Presentation Award	Sun-Hwa Jung, OTH Amberg-Weiden, Amberg, Germany
BSBB-2022 Best Flash Presentation & Poster Award	Pooja Singh, Indian Institute of Technology, Guwahati
	Meenu Jindal, CSIR India Institute of Petroleum, Dehradun
	Hrishikesh Pawar, National Institute of Technology, Waranagal
	Atmuri Shourya, National Institute of Technology, Surathkal
	Manish Hardas Ghumnani, Indian Institute of Technology, Guwahati
	Parmeshwar Vitthal Gavande, Indian Institute of Technology, Guwahati
	Renupama Bhoi, National Institute of Technology, Rourkela
	Preetanshika Tracy, CSIR-Indian Institute of Petroleum, Dehradun
	Urvashi Singh, Indian Institute of Technology, Delhi
	Akanksha Jain, South Asian University, New Delhi
	Srinithya Ravinuthala, National Institute of Technology, Tiruchirappalli
	Chandra Bhan, Indian Institute of Technology, Guwahati
Udaratta Bhattacharjee, Indian Institute of Technology, Guwahati	
BSBB-2022 Best Poster Award	Bhawna Tyagi, Jawaharlal Nehru University, Delhi



IITG, National and International Chairs, Chief guest, President BRSI and Conveners.

The Inauguration ceremony also marked opening of XIX Annual Convention of BRSI in which BRSI annual fellow awards and other category awards were also conferred. Dr P Binod was the Master of the Ceremony.

The session also witnessed honouring the winners of IBA-IFIBiop biennial awards to those winners who attended the event in-person in Guwahati.

On 8th 9th and 10th of December 2022, each day started with five parallel technical sessions. There were a total of 15 plenary lectures and 125 Invited lectures from India and abroad on broad areas of Agriculture and Crop Bioresources, Biotechnology for Energy, Environment and Industrial Application, Biotechnology for Medicine and Pharmaceuticals and Biotechnology for Sustainable Development having 4 subsections in each category. Resource persons from different sectors, leading experts in their own fields delivered lectures

that dealt with various topics and themes and gave greater insight about the need and importance of Biotechnology meeting the need of key SDG 2030.

Some of the key topics that were covered during the conference ranged from; Abiotic and biotic stress, plant biotechnology and transgenic crops, Food fermentation, probiotics and nutraceuticals., Agro residue management and alternative uses, Dairy and livestock resource management, Energy cropping and plantations, biomass, gaseous and liquid biofuels, biorefineries, Anaerobic digestion, fermentation technology, microbial products, Environmental genetic and metabolic bioengineering, advances in biological waste treatment, circular economy in Industries, Environmental Issues and challenges and way forward, Infectious diseases and cancer biology, Drug discovery and development, pharmacology & pharmacokinetics, Vaccine development, Biomedical Devices, Sustainable development and climate change, Life-cycle impact assessment: case studies, Data mining and analytics and Biosafety, Ethics and IPR.

On 8th of December, there was a public lecture organized on the topic “Chronic pain: An unsolved mystery-perspective of a Pain Physician” delivered by Dr. Amitesh Pathak, Integral University Hospital, Lucknow India and on 9th of December, a workshop on “Art of publication and proposal writing” was organised by Taylor and Fran-

cis which also witnessed release of two books published by Taylor & Francis and BRSI under the joint agreement.

On the concluding day of technical session, i.e., 10th December, 2022, a talk was presented by Dr SK Varshney, Head, International Division, DST on research and collaboration opportunities supported by the DST, Govt of India, New Delhi.

This was followed by a panel discussion on “Industry Young Researchers interaction” was organised, which was chaired and moderated by Dr Raghavendra Gaikawaiwari, CMD, Hi Tech Biosciences, Pune and included Dr. Sulakshna Jain, DST; Dr. Sanjeev Kumar Varshney, DST, Dr. Anjan Ray, Director, CSIR-IIP Dehradun, India and Dr. Vivek Agrawal, CMD, CDC-India, Jaipur as panellists.

Prof. Ashok Pandey introduced the chairman and panellists. This session was an exciting interaction among the panellist and the audience who deliberated and discussed in great detail about need of industries tie up with academic institutions and bridging the gap.

This session saw an enthusiastic participation from all stakeholders, particularly the young researchers and panellist were every so forthcoming to address all the questions that were asked.

Valedictory session was held on 10th December 2022 in which Prof. Latha Rangan presented a brief report on the proceedings of

the conference. This was followed by the award ceremony wherein best oral, poster and flash talk presentations in different categories were awarded.

These awards were sponsored by the Khanal Foundation, Nepal (six awards, each comprising a certificate and cash of Rs 4000), CEES-India (ten awards, each comprising a certificate and a book published by Elsevier, costing about US\$ 200 each) and BSBB-2022 (14 awards, each comprising a certificate and a memento).

This was followed by the declaration of the venue for the XX Convention of BRSI by Prof Ashok Pandey.

## *The XX Convention of BRSI will be held at Trivandrum during Nov 26-29, 2023 and be hosted by the CSIR-NIIST*

Dr Rajeev Sukumaran, Scientist and the convener of the conference made a presentation on the outlines of the plan of hosting the event as International Conference on New Horizons in Biotechnology (NHBT-2023).

A formal vote of thanks was proposed at the end of the valedictory session and theme and venue for the year 2023 was declared.

On the last day of the Conference that is on 11th Dec brief visit was arranged to the Research Park of IIT Guwahati run and maintained under the aegis of Industrial Interactions and Special Initiative (II&SI) Division based on the interest shown by the participants.

Participants got to see key players especially industries that have incubated their products and process of relevance especially pertinent to Biotech Sector. This session was also much appreciated although it could not be carried to a larger section on account of Institute holiday.

There was an overwhelming response and participation from different communities from North Eastern States. Participants shared their feedback and their overall experience about the conference. The Conference concluded the same way as it took off with inspiring note from Chief Mentor Prof. Ashok Pandey who also distributed the certificates to the participants.

## WINNERS OF BRSI ANNUAL AWARDS 2021 AND FELLOWS 2022

### HONORARY FELLOW

Professor Ganapati D Yadav



Professor Ganapati D. Yadav is one of the topmost, highly prolific, and accomplished engineering-scientists in India. He is the National Science Chair of Govt. of India, and Emeritus Professor of Eminence at the Institute of Chemical Technology, Mumbai of which he was the Vice Chancellor for over a decade. He is internationally recognized for his seminal contributions to education, research and innovation in Green Chemistry and Engineering, Catalysis, Chemical and Energy Engineering, Biotechnology and Nanotechnology. He has published 509 original research papers, holds 116 patents and three books with h-index of 65 and >16000 citations. He serves as the Adjunct Professor at University of Saskatchewan, Canada; Conjoint Professor, University of New Castle, Australia; Distinguished Adjunct Professor at IIT Guwahati, and

Distinguished Visiting Professor SOA University Bhubaneswar. He is an Independent Director on the boards of five public limited companies. Prof Yadav was conferred Padma Shri by the President of India in 2016 and received two honorary doctorates. He was elected to the US National Academy of Engineering in 2022.

The Biotech Research Society, India is privileged to honour Professor Ganapati D Yadav as Honorary Fellow of the Society for the year 2022 for his outstanding contributions in Chemical Engineering and Biotechnology.

### FELLOW (FBRS)

Professor RS Singh



Dr RS Singh is currently Professor at the Department of Chemical Engineering, Indian Institute of Technology (BHU), Varanasi. His research focus is on bioremediation of organic waste, microbial fuel cell and aerosols including bioaerosols. Prof. Singh has extensively worked on various kinds

of bioreactors for biodegradation of organic wastes and on microbial fuel cell for biodegradation of organic wastes along with power generation. He is the recipient of several awards and honours, which include Rastriya Fertilizer and Chemical Award by Fertilizer Association of India and is Fellow of Institute of Engineers (India).

The Biotech Research Society, India is privileged to honour Professor RS Singh as Fellow(FBRS) of the Society for the year 2022 for his outstanding contributions in Environmental Biotechnology.

Professor Ch. Sasikala

Dr Ch. Sasikala is currently working as Professor and Director, Institute of Science and Technology, Jawaharlal Nehru Technological University, Hyderabad. Her research interests are in the area of bacterial taxonomy and bioprospecting, especially for environmental management. She has edited one book and published over 240 papers and three patents. She is an elected member of International Subcommittee on the taxonomy of phototrophic bacteria of International union of Microbiological Societies. DR Sasikala is Fellow of Association of Microbiologists of India and is a recipient of State Best Teacher Award in 2016 from the Government of Telangana, Prof BN Johri award for Microbial Diversity and EK Janaki Ammal National Award on Microbial Taxonomy.

The Biotech Research Society, India

is privileged to honour Professor Ch. Sasikala as Fellow (FBRs) of the Society for the year 2022 for her outstanding contributions in Bacterial diversity and bioprospecting.

Professor YV Nancharaiah

Dr YV Nancharaiah is currently Scientific Officer 'H' and Head of Biofouling and Biofilm Processes Section, Bhabha Atomic Research Centre, Kalpakkam and Professor of Homi Bhabha National Institute, Mumbai. His research focus has been on biofilm control, biofilm-based bioremediation, bacteria-laden granules and biological wastewater treatment. Prof Nancharaiah has 110 papers, one patent, and one book. He has received DAE Homi Bhabha Science & Technology Award, DAE Group Achievement Award, ASM Professor, Indo-US Research Fellowship and Marie Curie Fellowship – Senior Researcher.

The Biotech Research Society, India is privileged to honour Professor YV Nancharaiah as Fellow (FBRs) of the Society for the year 2022 for his outstanding contributions in Environmental Biotechnology.

Dr Hifzur Rahman Siddique



Dr Hifzur Rahman Siddique is currently a Senior Assistant Professor in the Department of Zoology, Aligarh

Muslim University, Aligarh. He has worked at Indian Institute of Toxicology Research, University of Wisconsin, University of Minnesota, and the University of Southern California. His research focus has been on Cancer Stem Cells, Drug Resistance, and Molecular Pharmacology/Toxicology. Dr. Siddique has 85 papers, one patent, one book and nine book chapters. His work on therapy-resistant cancer was selected as the best among three "Featured Prostate Cancer Research" work by the USA Department of Defense in 2014. He has won several awards and honors, including Sir Syed Innovation Award, AEDS-Distinguish Scientist Award, SPER-Innovative Researcher Award, IABS-Farha-Deeba Outstanding Cancer Research Award, India, etc.

The Biotech Research Society, India is privileged to honour Dr Hifzur Rahman Siddique as Fellow (FBRs) of the Society for the year 2022 for his outstanding contributions in Microbial and Enzyme Biotechnology.

Dr Ram Prasad

Dr Ram Prasad is currently Associate Professor at the Department of Botany, Mahatma Gandhi Central University, Motihari. His research focus has been on microbial nanobiotechnology, environmental microbiology, plant-microbe-interactions, etc. Dr Prasad has worked on the model fungus *Serendipita indica* (*Piriformospora indica*) to use this endophytic fungus more efficiently for the betterment of humanity, food and nutritional securities and medicinal applications. He has 250 papers & book chapters and seven patents. Dr. Prasad has been awarded the Young Scientist Award and Prof JS Datta Munshi Gold Medal by the International Society for Ecological Communications and is Fellow of Society for Applied Biotech-

nology,

The Biotech Research Society, India is privileged to honour Dr Ram Prasad as Fellow (FBRs) of the Society for the year 2022 for his outstanding contributions in Microbial and Enzyme Biotechnology.

## BHU CENTENNIAL AWARD

Professor Alok Dhawan



Professor Alok Dhawan is currently Director, Centre of BioMedical Research, Lucknow. Previously, he served as Director, CSIR-Indian Institute of Toxicology Research, Lucknow during 2015-2020. He was the Founding Director, Institute of Life Sciences, and Dean, Planning and Development, Ahmedabad University, Gujarat. He has played a stellar role in building institutions of excellence in higher education and national laboratories across the country. Professor Dhawan established several areas of toxicology at CSIR-IITR, and also contributed extensively in establishing a framework of risk assessment of fragrance materials. He started the area of Nanomaterial Toxicology in India and contributed extensively in understanding the mechanism of toxicity of carbon, metal oxide and metal

based engineered nanomaterials. He has published >150 papers, 20 book chapters, seven patents, six copyrights and has edited eleven books.

Professor Dhawan is a Fellow of National Academy of Sciences (India); Academy of Toxicological Sciences, USA; The Royal Society of Chemistry, UK; National Academy of Medical Sciences; Society of Toxicology (India); etc. He is Founder, Indian Nanoscience Society; President, Society of Toxicology, India since 2018. Prof Dhawan has received several awards and honours, including CSIR Young Scientist Award, INSA Young Scientist medal, Shakuntala Amir Chand Prize of ICMR, BOYSCAST Fellowship of DST, etc and was awarded DSc Degree (h.c.) by the University of Bradford, U.K. in 2017.

The Biotech Research Society, India is privileged to honour Professor Alok Dhawan with BHU Centennial Award of the Society for the year 2021 for his outstanding contributions in Nano-material Toxicology and Life Sciences.

## **INDUSTRIAL MEDAL AWARD**

Dr Mohana Krishna Reddy Mudiam

Dr Mohana Krishna Reddy Mudiam is currently Senior Principal Scientist & Professor (AcSIR) at CSIR-Indian Institute of Chemical Technology, Hyderabad. He obtained his PhD in 2005 and had post-doctoral stint on medicinal chemistry at JHMI, USA. His research focus is to evaluate the occurrence/fate, transport and accumulation of chemicals in various matrices using hyphenated analytical approaches and establish mass spectrometry-based metabolomics as a comprehensive tool in food safety, environmental toxicology and drug dis-

covery. He has published 104 papers with 3450 citations (h index of 37) and is a member of the team of recipient of CSIR Technology Award and recipient of BOYSCAST fellowship.

The Biotech Research Society, India is privileged to honor Dr Mohana Krishna Reddy Mudiam with Industrial Medal Award of the Society for the year 2021 for his outstanding contributions in Medical, Food and Environmental Biotechnology.

## **YOUNG SCIENTIST AWARD**

Dr Ayon Tarafdar

Dr Ayon Tarafdar is currently working as an ARS Scientist at the ICAR-Indian Veterinary Research Institute, Bareilly. He obtained PhD degree in 2022 and has worked previously as a researcher in Washington University, USA. His research focus has been on food process engineering, bioprocess modelling and optimization, machine learning, food waste valorization, etc. Dr Tarafdar has published 78 papers, ten book chapters, two books and one patent. He has been awarded TE-QIP-II fellowship, NIFTEM research fellowship, UGC-JRF fellowship, CSIR SRF fellowship and SERB-DST international travel grant and has won best poster and presentation award in several conferences in India and abroad.

The Biotech Research Society, India is privileged to honour Dr Ayon Tarafdar with the Young Scientist Award of the Society for the year 2021 for his outstanding contributions in Bioprocess Technology.

## **WOMAN SCIENTIST AWARD**

Professor Archana Tiwari

Dr Archana Tiwari is currently Professor at Amity Institute of Biotechnology, Amity University, Noida, India. She is a PhD from University of Allahabad, a gold medalist and distinction holder in Botany. Her key research interests include Phycoprospecting Diatoms for wastewater remediation and high-value products. Prof Tiwari has published 85 papers, ten books and several chapters. She was awarded Researcher of the Year Award in 2016 by Noida International University and Distinguished Scientist Award in 2016 by the Society for Recent Development in Agriculture.

The Biotech Research Society, India is privileged to honour Professor Archana Tiwari with Woman Scientist Award of the Society for the year 2021 for her outstanding contributions in Algal Biotechnology.

## **MALAVIYA MEMORIAL AWARD (Senior Faculty)**

Professor Parag R. Gogate

Dr Parag R. Gogate is currently Professor at the Department of Chemical Engineering at Institute of Chemical Technology, Mumbai. Prof Gogate's research has focused on the application of cavitation reactors for process intensification of different biochemical/biotechnological processing applications such as biofuel production, enzymatic reactions, etc. He has published 375 papers with 20,500 citations (Scopus). Prof Gogate is a fellow of INAE, IChemE (UK), IEI and ICS.

The Biotech Research Society, India is privileged to honour Professor Parag R. Gogate with Malaviya Memorial Award (Senior Faculty) of the Society for the year 2021 for his outstanding



contributions in Bioprocess Technology focusing on process intensification of bioprocessing.

## **MALAVIYA MEMORIAL AWARD (Young Faculty)**

Dr Vijay Kumar Prajapati

Dr Vijay Kumar Prajapati is currently Assistant Professor at the Department of Biochemistry, Central University of Rajasthan, Ajmer. He obtained PhD degree in 2012 from Banaras Hindu University and did Postdoc studies in the University of South Alabama, USA. His research focus is on drug discovery and vaccine development. He has published papers and is a recipient of INSA Medal for Young Scientist from Indian National Science Academy, Shakuntla Amir Chand Prize from Indian Council of Medical Research, Associateship from Indian Academy of Sciences, Young Scientist Award from The Biotech Research Society, India (BRSI) and Prof. Umakant Sinha Memorial Award in Indian Science Congress Association.

The Biotech Research Society, India is privileged to honor Dr Vijay Kumar Prajapati with Malaviya Memorial Award (Young Faculty) of the Society for the year 2021 for his outstanding contributions in Medical Biotechnology with focus on drug discovery and vaccine development.

## **Prof SB CHINCHOLKAR MEMORIAL AWARD**

Dr Rajib Deb

Dr Rajib Deb is currently Senior Scientist at the Department of Animal Health, ICAR-National Research Center on Pig, Guwahati. He obtained PhD degree in 2014 and had post-doctoral stints on Livestock Genomics in

Brazil. His research focus has been on development of diagnostics and vaccines against swine diseases. Dr Deb has developed various technologies, viz., detection of adulteration of cow milk/meat with other species; diagnostic kits against piggery diseases and genetic disorders of livestock, etc which are under commercialization. He has published 100 papers, six patents and seven books and has been conferred TWAS fellowship, ICAR-Post Doctoral Research Fellowship, INSA -visiting Scientist Fellowship.

The Biotech Research Society, India is privileged to honour Dr Rajib Deb with Professor S B Chincholkar Memorial Award of the Society for the year 2021 for his outstanding contributions in Veterinary Science.

## **CDC INDIA-PROF ASHOK PANDEY RESEARCH EXCELLENCE AWARD**

Dr Sunil A. Patil

Dr Sunil A. Patil is currently an Assistant Professor of Environmental Microbiology and Biotechnology at the Earth and Environmental Sciences department in Indian Institute of Science, Education and Research (IISER) Mohali. He obtained PhD degree in Microbiology from the SP Pune University in 2011 and had post-doctoral stints at Technical University Braunschweig, Germany; Lund University, Sweden and Ghent University, Belgium. His research focuses on understanding extracellular electron transfer-based anaerobic metabolisms and bio-electrochemical technologies. Dr Patil has published 60 papers and three patents. He is a recipient of the DAAD doctoral scholarship, Marie Skłodowska-Curie postdoctoral fellowship, Alexander von Humboldt fellowship for senior researchers and the best teacher award 2021 of IISER

Mohali. He is on the editorial board of Bioresource Technology Reports and the Associate Editor for the Microbiotechnology specialty section of Frontiers in Microbiology, Frontiers in Bioengineering and Biotechnology, and Environmental Science journals. He has been on the International Society of Microbial Electrochemistry and Technology board of directors since 2020.

The Biotech Research Society, India is privileged to honour Dr Sunil A. Patil with the CDC India-Prof Ashok Pandey Research Excellence Award of the Society for the year 2021 for his outstanding contributions in Environmental Biotechnology.

## **AU-CBT EXCELLENCE AWARD**

Mr Rounak Chourasia

Mr Rounak Chourasia is currently a PhD scholar at the Institute of Bioresources and Sustainable Development, Regional Centre, Sikkim. He completed his Masters in Microbiology in 2016 from University of North Bengal and is a university first rank holder in BSc and MSc Microbiology. He has qualified The Graduate Aptitude Test in Engineering in Life Science in 2017. His research focus has been on the development of bioactive peptides enriched fermented milk products using native proteolytic bacterial strains of Sikkim Himalaya. Mr Chourasia has published 16 papers and six book chapters.

The Biotech Research Society, India is privileged to honour Mr Rounak Chourasia with AU-CBT Excellence Award of the Society for the year 2021 for his outstanding contributions in Food and Industrial Biotechnology.

## Melatonin: A molecule endowed with a multitude of functions in animals and plants

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### Introduction

Melatonin (N-acetyl-5-methoxy-tryptamine) is a structural analogue of indole hormones such as tryptophan, serotonin, and indole-3-acetic acid (IAA). Melatonin was first isolated by Aaron Lerner, mainly in pineal gland of bovine, in 1958. Melatonin is widely distributed and intensively investigated in mammals, reptiles, amphibians, birds, and bony and cartilaginous fishes. Furthermore, melatonin was also reported in various organisms, including prokaryotes, protists, algae, fungi, and plants. In 1995, three research teams identified melatonin-like substance known as phyto-melatonin across multiple plant organs, including roots, shoots, fruits, and seeds. It has also been identified in important crops like rice, wheat, barley, and oats. Other foods include herbs, olive oil, coffee, tea, wine, and beer. The melatonin synthesizing enzyme arylalkyl amine N-acetyl transferase (AANAT) – has not been identified in plants. The serotonin N-acetylating enzyme in plants may differ greatly from the animal AANAT concerning sequence and structure. This means there are multiple evolutionary origins of enzymes with these catalytic properties.

### Chemistry of melatonin

Melatonin is known by the chemical formula  $C_{13}H_{16}N_2O_2$ . Moreover, since it originated from a tryptophan molecule, it is classified as an indolamine compound. The indole chemical scaffold is functionalized with 3-amide and 5-alkoxy groups.

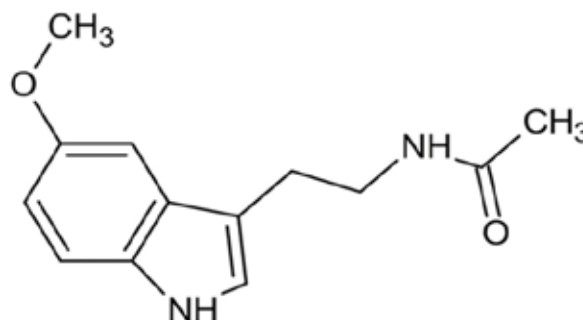


Fig.1. Structural formula of melatonin

### Function of melatonin in animals

Melatonin is an essential animal hormone involved in

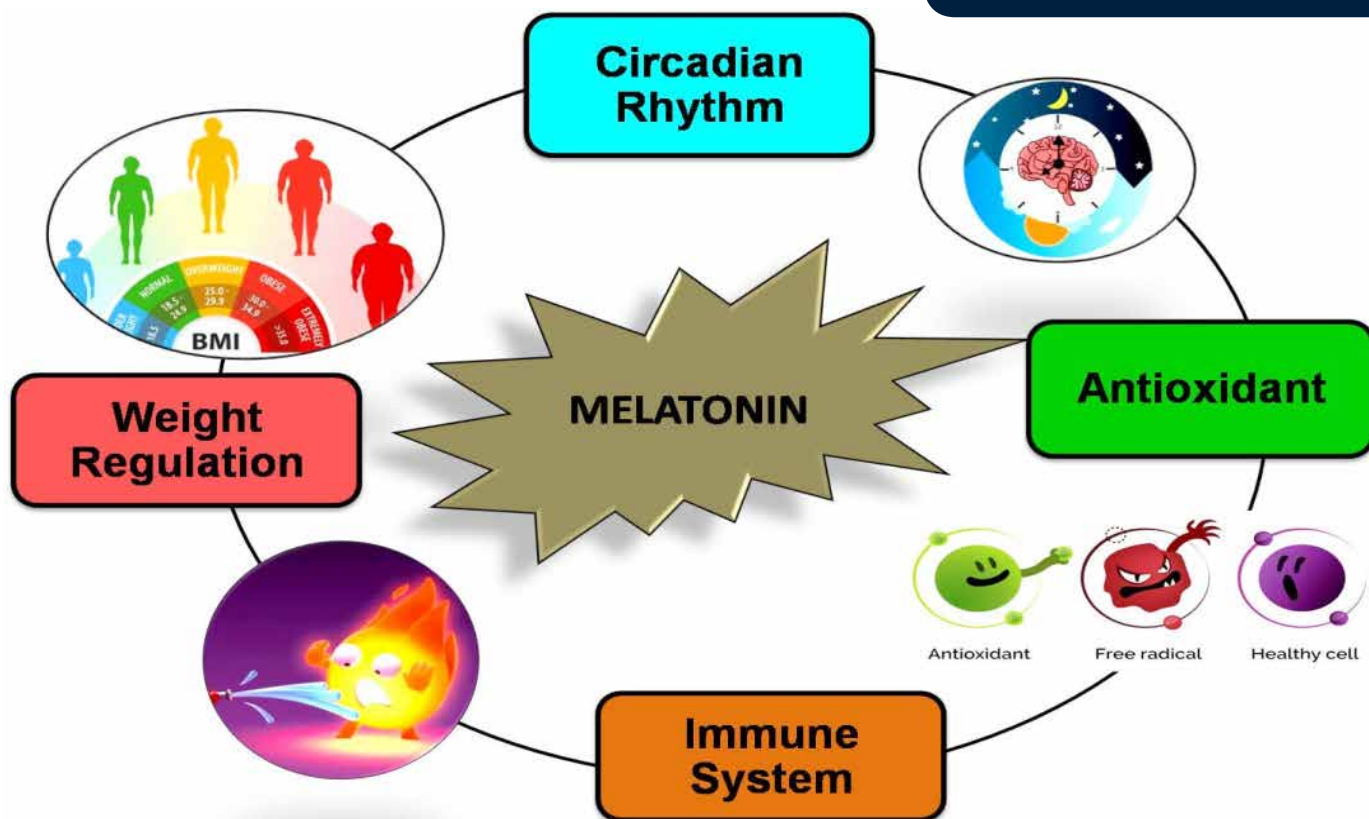


Fig. 2. Schematic representation of the role of melatonin in animals.

several biological processes, including antioxidation, circadian rhythms, seasonal reproduction, sleep, sexual behavior, mood, temperature homeostasis, retina physiology, and immunological enhancement.

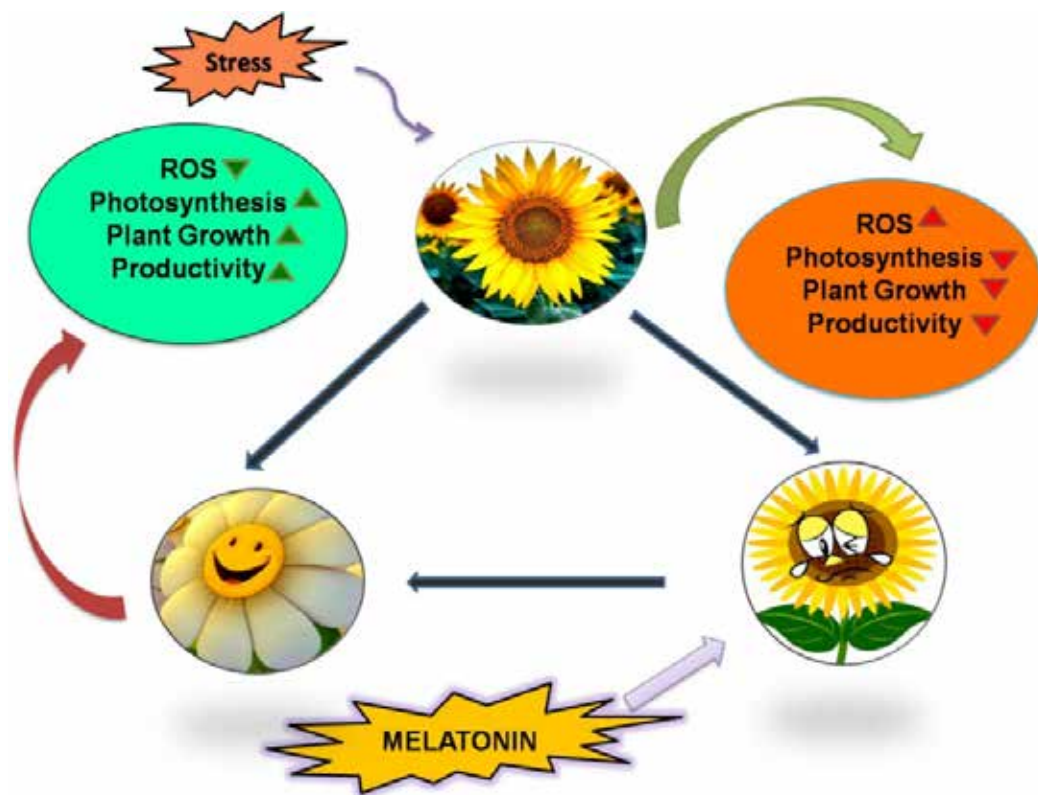
- The antioxidant activity of melatonin protects the gastrointestinal tract against ulcerations by reducing the secretion of HCl.
- Protection against the oxidative effects of bile acids on the intestinal epithelium as well as by increasing the duodenal mucosal secretion of bicarbonate.
- Promotes epithelium regeneration and improves microcirculation, melatonin protects against stomach ulcerations.
- It is widely used against sleep disorders, jet lag, anti-aging, anti-stress and anti-cancer.
- Treating tumors with melatonin improves chemo- and radiotherapy sensitivity, acting as a synergistic molecule in the control of cancer cells.
- It also mitigates acute damage to normal cells,

protecting them against drug toxicity and possibly enhancing immune responses.

### The function of melatonin in plants

Melatonin plays multiple roles in plants, including increasing seed germination, promoting lateral root development, delaying leaf senescence, protecting the plant from stress, and increasing crop yield. Also, it has been demonstrated as an effective plant stimulant against biotic and abiotic stress.

- It triggers the accumulation of compatible solutes such as total soluble sugars and proline content.
- Treatment of plants with exogenous melatonin could enhance plant tolerance to drought stress.
- It reduces oxidative damage under drought stress by directly scavenging ROS (Reactive Oxygen Species) such as hydroxyl radical (OH), hydrogen



**Fig. 3.** Schematic representation of the role of melatonin in plants

peroxide, nitric oxide, peroxyxynitrite anion, and peroxyxynitrous acid.

- This results in lower electrolyte leakage, MDA (Malondialdehyde) levels, and increased antioxidant enzyme activity.
- It regulates the transcription of various essential genes involved in antioxidant defense mechanisms.

Although plants naturally produce melatonin, its concentration increases in response to abiotic stress. Melatonin down-regulates the ABA synthesis gene and up-regulates its catabolic genes resulting in ABA reduction. Melatonin-induced decreases in the ABA concentration increase the photosynthesis rate. Whereas it increases the cytokinin concentration, inhibiting the leaf senescence, e.g., in *Malus* sps.

## Conclusion:

Melatonin is a natural hormone present in both plants and animals. Melatonin helps plants respond against various biotic and abiotic stresses like animals. Henceforth, it can be used as an effective stimulant for increased crop production under adverse environmental conditions. Furthermore, more research is needed to understand better melatonin's implications in plants and its counter role against various stresses.

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# Giant Viruses

by Dr. Jaspreet Kaur, Sr. Assistant Professor, Zoology Department, Maitreyi College, University of Delhi

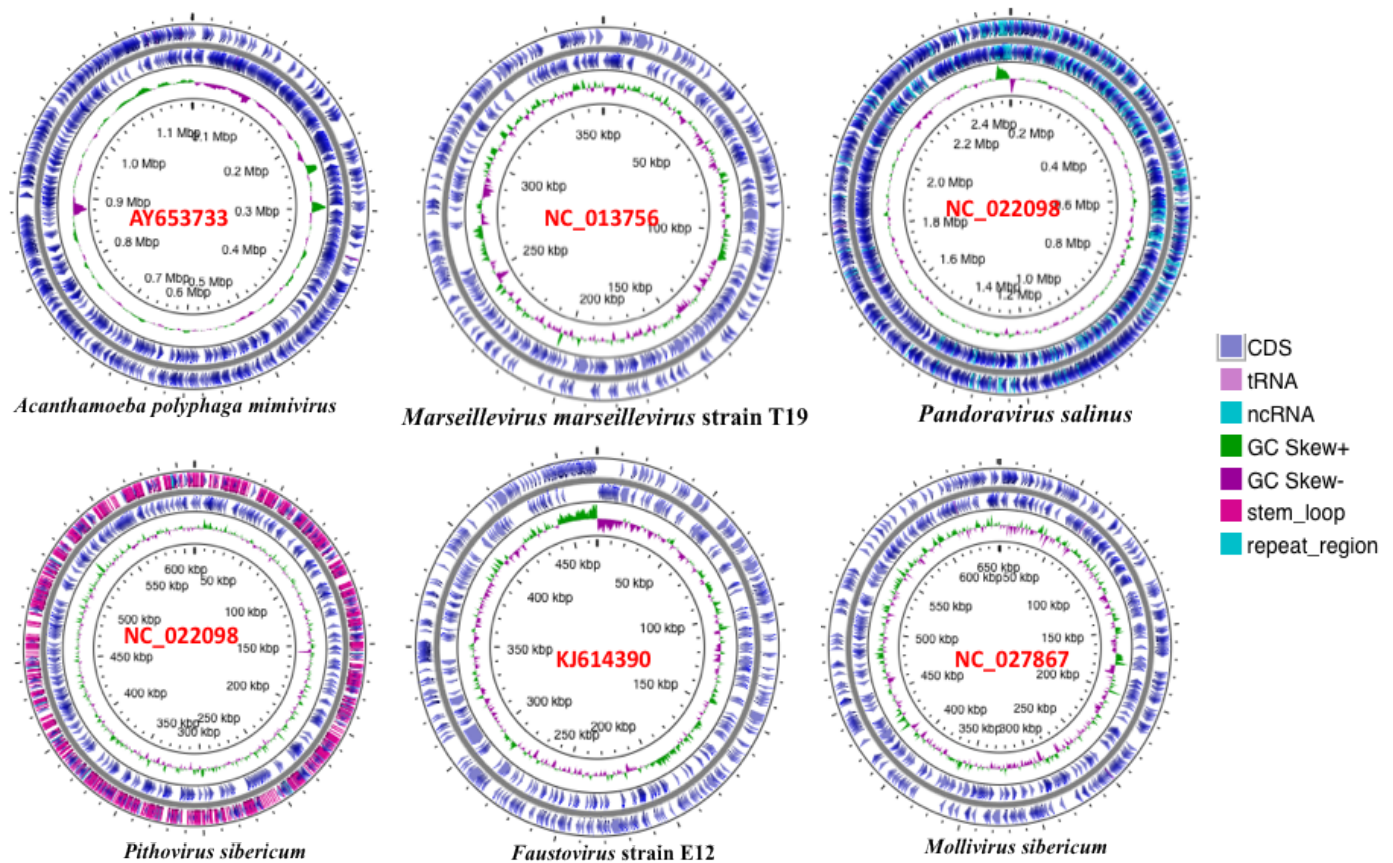


Figure 1. Circular genome maps of six giant viruses, with the GenBank Accession numbers written in center of the maps. The innermost circle represents the genome scale while blue arrows in the concentric rings represent the putative coding sequences (CDSs). All the maps have been created from the GenBank files using <https://proksee.ca/projects/new>

**G**iant viruses!! yes, you read it right. When we hear the term ‘viruses’, we usually imagine small organisms composed of DNA or RNA genomes which are only few kilo base pairs in size. In fact, one of the smallest known viruses, *Vaccinia* has a length of ~220–450 nm, which is

roughly 50 times smaller than a pollen grain and consists of only 270 genes (Johnson et al., 2006).

Recently, the discovery of ‘*Giant Viruses*’, with massive genomes have challenged our current understanding about the origin of cellular life. One of the first giant viruses, which was discovered by Raoult et al in 2004, was a dou-

ble stranded DNA *Mimivirus*, with a genome size of ~1.2 mega base pairs and 911 protein coding genes. This giant virus (~400 nm diameter) with size that of a *Mycoplasma*, was isolated from *Amoebae* growing in the water of a cooling tower of a hospital in Bradford, England.

*Mimivirus*, belonging to new *Mimiviridae* family of nucleocytoplasmic large DNA viruses (NCLDVs), consists of many genes which are not found in other dsDNA viruses like genes related to protein translation, DNA repair, chaperones, and new enzymatic pathways as well as the inclusion of type IA, type IB, and type II topoisomerases. The presence of genes relevant to mRNA translation except ribosome components makes these giant viruses unique in nature.

In addition to *Mimiviridae*, four new *amoeba* infecting giant viral families have been described, namely, *Marseilleviridae*, pandoraviruses, faustoviruses, and mimivirus-viropages (Aherfi et al., 2016). Another group of giant viruses, the *Klosneuviruses* was discovered by Schulz et al in 2017 from a wastewater treatment plant in Klosterneuburg, Austria using metagenomic data. The 1.57 Mb genome of *Klosneuvirus* (KNV) shares more than 200 gene families with *Mimiviridae* and shares 12 of the 355 genes with eukaryotes including genes related to protein translation.

Such significant findings point towards the dynamic evolution of giant viruses like KNVs, which may have acquired eukaryotic genes during the course of evolution or such genes, may be remnant parts of an ancestral gene system, which may have undergone genome reduction process. Then, recently, the discovery of genomic signatures of giant viruses from environmental samples by a team of researchers from Indian Institute of Technology, Mumbai, India (Chatterjee et al., 2019), has further revolutionized the origin of these viruses and their position in the existing phylogenies encompassing different organisms.

Nevertheless, the discovery of these giant viruses and their annotated genes has sparked debates in the current “tree

of life”. There are contrasting views regarding the origin of these viruses. These viruses may have originated long before the emergence of three domains of life-eukarya, archaea and bacteria or these viruses suggest the emergence of fourth domain of life. The consensus for the different schools of thought regarding the origin of these giant viruses shall be resolved in near future with more scientific evidences and studies.

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## Fish Genomics: Present Status, Applications and Future Challenges

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### Abstract

Fish genomics has made significant progress in recent years, with the development of new genomic technologies and the availability of more complete genome sequences. This has allowed researchers to better understand the genetic basis of various traits and diseases, as well as the evolutionary history of fish species. Fish genomics has also led to the identification of potential targets for selective breeding and the development of new tools for conservation and management of fish populations. One of the main applications of fish genomics is in aquaculture, where it has been used to improve growth rates, disease resistance, and other important traits. Genomic information can also help in the development of new vaccines and treatments for fish diseases. Additionally, fish genomics has been used to study the impacts of environmental stressors such as pollution and climate change on fish populations, which has important implications for conservation efforts. However, there are still many challenges to be addressed in fish genomics. For instance, there is a need to develop better reference genomes for a wider range of fish species, as many important species are still poorly represented in existing databases. Additionally, there are challenges in integrating genomic data with other types of data, such as phenotypic and environmental data, to better understand the complex interactions between genes, traits, and the environment. Finally, there are ethical and social issues to consider, such as the potential impact of genetically modified fish on natural ecosystems and the acceptance of these technologies by consumers and stakeholders. Fish genomics has the potential to significantly improve our understanding of fish biology and help address important challenges in aquaculture and conservation. However, further research is needed to overcome the remaining technical and societal challenges.



## Introduction

Fish genomics is a rapidly growing field of research that is focused on studying the genetic makeup of various fish species. Genomics research can help us to understand the genetic basis of important traits in fish, such as growth rate, disease resistance, and adaptation to changing environmental conditions. This knowledge can be used to develop new tools and technologies to improve fish health and productivity, as well as to conserve fish species and their habitats. In this article, we will discuss the current status of fish genomics research and the challenges that researchers face in this field. The study of fish genomics requires the use of advanced technologies such as next-generation sequencing and bioinformatics. These tools allow researchers to sequence and analyze and quantify the genetic data quickly and accurately. The first fish genome to be sequenced was that of the pufferfish in 2002 (Neafsey and Palumbi, 2003). Since then, the genomes of many other fish species have been sequenced, including the Atlantic salmon, tilapia, zebrafish, and rainbow trout, among others.

## Aquaculture and Fish Genomic

Aquaculture includes the farming of fish and other aquatic organisms for food production, and it is an increasingly important industry worldwide. By studying the genetics of fish, researchers can develop new breeds of fish that are more resistant to diseases, grow faster, and have other desirable traits for aquaculture (Rather et al., 2023). This can help improve the efficiency and sustainability of fish farming operations and reduce the environmental impact of aquaculture. Fish genomics research can also help in the conservation of fish species and their habitats. Studying of fish genetics of can identify distinct genetic populations within a species, which can help in the development of more effective conservation strategies. For example, genetic information can be used to identify and protect populations of fish that are particularly vulnerable to overfishing or habitat loss. Another area of research prospectus in fish genomics is to study the evolution of fish species. Comparison between

the genomes of different fish species through DNA barcoding and genetic markers, researchers can gain insights into the evolutionary relationships between different fish groups and how they have adapted to different environmental conditions over time. (Figure 1)

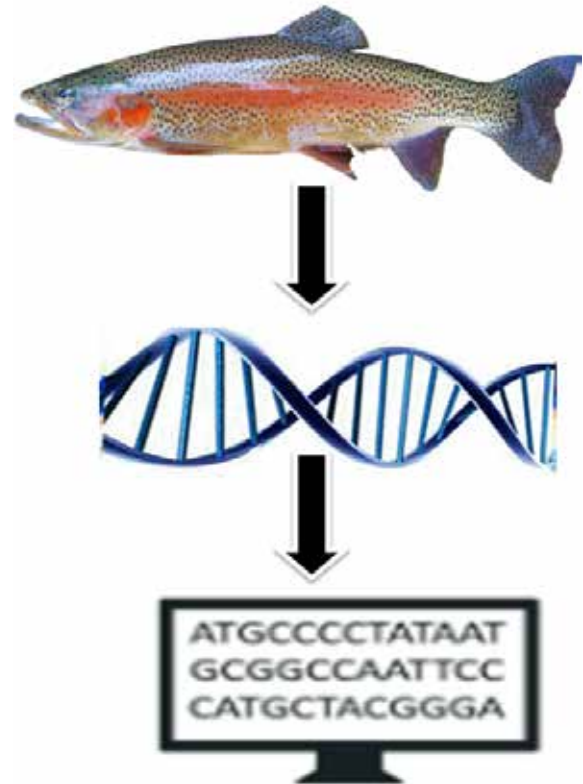


Figure 1: Rainbow trout fish genome sequence analysis

## Applications

Fish genomics has numerous applications in various fields, including aquaculture, fisheries management, conservation, and biomedical research. Some of the key applications of fish genomics are:

1. **Aquaculture:** Fish genomics can help improve the productivity and sustainability of fish farming operations by identifying genes and genetic markers associated with desirable traits such as growth rate, disease resistance, and feed efficiency. This knowledge can be

used to develop new breeds of fish that are better suited for aquaculture.

- 2. Fisheries management:** Fish genomics can provide important information about the genetic structure and diversity of fish populations, which can help in the development of more effective management strategies. For example, genetic information can be used to identify and protect genetically distinct populations of fish that are particularly vulnerable to overfishing or habitat loss.
- 3. Conservation:** Fish genomics can help in the conservation of threatened and endangered fish species by providing information about their genetic diversity, population structure, and evolutionary history. This knowledge can be used to develop more effective conservation strategies, such as identifying and protecting genetically distinct populations of fish.
- 4. Biomedical research:** Fish genomics can provide valuable insights into the genetics of human diseases and development. Fish have many biological similarities to humans, and the study of fish genetics can help researchers identify genes and genetic pathways that are involved in human diseases and development.
- 5. Evolutionary biology:** Fish genomics can provide insights into the evolutionary relationships between different fish species and how they have adapted to different environmental conditions over time. This knowledge can help us understand the origins and diversification of fish species and their ecological roles in aquatic ecosystems.

## Current Status of Fish Genomics Research

Over the past few decades, researchers have made significant progress in the study of fish genomics. The development of advanced technologies such as next-generation sequencing and bioinformatics has made it possible

to study the genomes of many fish species quickly and cost-effectively. One of the major achievements in fish genomics research has been the sequencing of several fish genomes, including the genomes of Atlantic salmon, tilapia, and zebrafish (Abdelrahman et al., 2017). These genome sequences have provided researchers with valuable insights into the genetic makeup of fish species, including their evolutionary history, genetic diversity, and the genetic basis of various traits (Sahoo, L et al., 2019). The study of fish genomics has also led to the identification of many genes that are important for fish health and productivity (Raposo et al., 2020). For example, researchers have identified genes that are involved in the immune response of fish, which can help in developing new treatments for fish diseases. Similarly, the identification of genes that control the growth and development of fish can help in the selective breeding of fish for aquaculture. Overall, fish genomics is an exciting and rapidly growing field of research that has numerous applications in areas such as aquaculture, fisheries management, and conservation. Continued investment in this field is essential to further our understanding of fish biology and to develop new tools and technologies to improve fish health and productivity.

## Challenges in Fish Genomics Research

Despite the significant progress in fish genomics research, there are still several challenges that researchers face in this field. One of the major challenges is the lack of genomic resources for many fish species. While the genomes of several fish species have been sequenced, there are thousands of fish species for which no genomic resources are available. This limits our ability to study the genetics of these species and develop new tools and technologies for their management.

Complexity of fish genomes is another challenge in fish genomics research. Fish genomes are often large

and complex having repetitive gene sequences that are difficult to sequence and analyze. This makes it challenging to study the genetics of many fish species and to identify the genes that are important for their health and productivity.

In addition to this, there are ethical and societal concerns regarding the fish genomics study. For example, the development of genetically modified fish for aquaculture may have environmental and health implications that need to be carefully considered. Similarly, the use of genetic information for selective breeding of fish may raise concerns about animal welfare and genetic diversity.

## Conclusion

The study of fish genomics has made significant progress in recent years, with the development of advanced technologies and the sequencing of several fish genomes. However, there are still several challenges that researchers face in this field, including the lack of genomic resources for many fish species, the complexity of fish genomes, and ethical and societal concerns. Addressing these challenges will require continued investment in research and collaboration among researchers, policymakers, and stakeholders in the fish industry.

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# Featured Biotech News

**Dr Jitendra Singh announces an exclusive women's portal for research grants and funds from April, 1 2023**



**T**o mark the International Women's Day, Union Minister of State (Independent Charge) Science & Technology; Minister of State (Independent Charge) Earth

Sciences; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, Dr Jitendra Singh today announced an exclusive women's portal for research grants and funds. The portal will become functional with effect from 1st of April.

The Minister was addressing the International Women's Day celebration programme organized by the Council of Scientific & Industrial Research (CSIR) here. He informed that the Council CSIR has decided to start exclusive Research

Grants for Women Scientists under CSIR-ASPIRE and an exclusive portal in this regard will be available from April 1, 2023. The Special Call inviting proposals from Women Scientists will open the same day.

Pertinent to mention that the proposal for inviting research grant proposals from Women Scientists under Extramural Research Scheme, was approved during the 200th meeting of the Governing Body of CSIR on 17th December, 2022 under the chairmanship of Dr Jitendra Singh.

The funds will be provided for staff (JRF/SRF/RA), contingency and minor equipment. The total budget of a research proposal including research fellow's stipend should generally not exceed the limit of 25-30 lacs.

Dr. Jitendra Singh said, this initiative is aligned to the Prime Minister Shri Narendra Modi's initiative to empower women and promote 'Nari Shakti' in the country.

"As we move towards Amrit Kal, this is another visionary step towards the Prime Minister Modi's efforts to put Nari Shakti at the forefront of India's development journey," he said.

CSIR has been taking several initiatives towards Women empowerment, including 15% discount on CSIR technologies for women entrepreneurs offered by CSIR- Central Leather Research Institute and a slew of training programmes

across the whole spectrum of CSIR domain. In August last year, for the first time in the history of CSIR, senior electrochemical scientist Ms. Nallathamby Kalaiselvi became the first woman Director General to head the premier scientific R&D body that constitutes 38 research institutes across the country.

Dr. Jitendra Singh said, Prime Minister Modi considers women-led development a central dimension of India's progress and necessary for strengthening India.

"In the last nine years, under Prime Minister Narendra Modi, the government has launched numerous welfare schemes that have aimed to empower women and make them lead India's development journey. His efforts are enabling women to overcome social barriers and fulfil their aspirations," he said.

***Only women scientists across the country will be eligible to apply for research grants to carry out R&D in major disciplines of science and engineering viz Life Sciences, Chemical Sciences, Physical Sciences, Engineering Sciences and inter/trans disciplinary sciences.***

Dr. Jitendra Singh said 68% of 2 crore PM Awas-Gramin beneficiaries are women and over 23 crore MUDRA loans have been granted to Women beneficiaries. For the first time, sex ratio in India has improved to 1,020 women per 1,000 men, according to the NFHS-5 survey, he said.

"PM Modi has made unshackling women and freeing them from the drudgery of everyday life a key objective of policy making. Every flagship welfare scheme launched by the Modi government has improved the lives of women across the country," he said.

Dr. Jitendra Singh said, in the last 9 years, there has been a massive increase in Women Police Personnel. In 2018, PM Modi announced a landmark decision to allow Permanent Commission for Women in the Armed Forces. There are more than 10,000 Women Officers serving in the Armed Forces, the majority in the Medical Services.

"Now Women are breaking the glass ceiling in every sphere. Only recently, the Indian Air Force posted Group Captain Shaliza Dhama as the first woman officer to command a missile squadron in the Western sector facing Pakistan. Women CRPF combatants have been inducted into the elite anti-Maoist COBRA Unit. Women officers have also started taking command of various Army units. The Navy has also started inducting Women Officers on frontline warships," he said.

# Agri-Start-ups Graduation Ceremony Organized by a-IDEA, ICAR-NAARM



March 25, 2023

a-IDEA, The Technology Business Incubator of ICAR-NAARM, Hyderabad organized its First Graduation Ceremony of Agri-Startups at ICAR-NAARM, Hyderabad, to commemorate the success of the Agri Startups and to support and encourage the startup ecosystem in agriculture and allied sectors.

Twenty Agri-startups who are incubated under a-IDEA's incubation program titled "KRISHIBOOT 1.0" received certificates and mementos and four winners of Aggnite 3.0 were also awarded certificates and cash prizes.

Shri. Devasis Padhi, Chief General Manager (OFDD), NABARD, Mumbai delivered the Chief Guest Address, he highlighted that start-ups must make themselves strong and not rely on funds and grants.

Mr. Shantanu Pendsey, CGM, SBI,

Mumbai shared his thoughts on the importance of start-up products being market ready. He expressed his interest in making start-ups bank ready.

The presidential address delivered by Dr. Ch. Srinivasa Rao, President, a-IDEA & Director, NAARM wherein he stated the importance of value addition of fruits and the necessity for continuous innovation.

Dr. L. Narasimha Murthy, Senior Executive Director, NFDB, Hyderabad stated the activities carried out by NFDB and the schemes promoting aquahub/ aquaculture besides highlighting the subsidies available for women in the fisheries sector.

Dr. G. Venkateswarlu, Vice President, a-IDEA and Joint Director, ICAR-NAARM in his welcome address highlighted the significance of the graduation ceremony and the various initiatives of a-IDEA.

Dr. Senthil Vinayagam, CEO, a-IDEA presented the overall program details earlier.

Mr. Emmanuel Murray, Investment Director, Caspian, Hyderabad expressed the support extended by CASPIAN over the years as both an investor, ecosystem partner, sponsor to a-IDEA's various programs.

Ms. Sunita Singh, Executive Vice President, Wadhvani Foundation, Mumbai spoke on the sustainability aspects of agri-startups in India.

About 100 startups, 50 students, farmers, outreach partners, ecosystem partners, mentors, banking officials, other incubation centre managers, investors, scientists, faculty and officials from SAU's/ ABI's/ TBI's and employees of ICAR-NAARM, a-IDEA staff participated in the event.

Source: ICAR-National Academy of Agricultural Research Management

# An Innovative Digital Seed System developed by ICAR-IIWBR, Karnal

March 26, 2023

During 2020 under Covid 19, a global pandemic situation, an on-line Seed Portal (iiwbrseed.in) was developed by ICAR-IIWBR, Karnal to provide seed of recent wheat & barley varieties to farmers.

The seed portal was designed and executed through IIWBR website in the September. The interested farmers submit the desired information (name, village, mobile number, district and state, upload soft copy of Aadhar card, select variety, quantity of seed) for registration.

The farmer gets OTP on mobile to complete the registration process. The farmers are grouped state-wise and district-wise. The registered farmers are informed at least one week in advance about date and time of seed collection through bulk SMS to facilitate hassle free seed distribution.



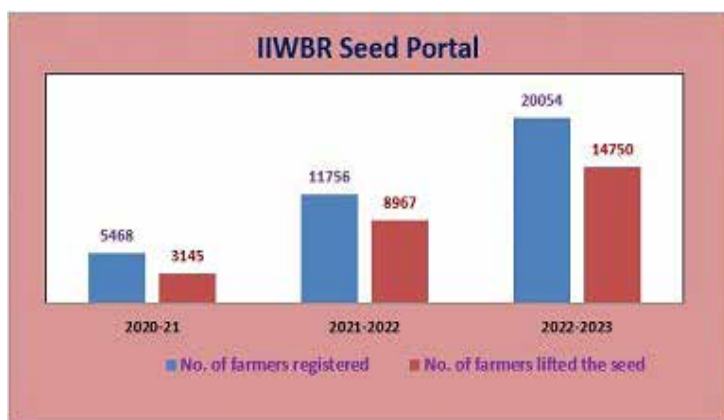
On an average, daily 3000 farmers collect seed as per the schedule. All the payments are made in digital modes viz., QR code, net banking or card swipe).

ICAR-IIWBR, Karnal generally open the Farmer Seed Portal (iiwbrseed.in) in the last week of September till the availability (5-10 days) of seed every year.

During 2022-23, a total of 20054 farmers were registered from

11 states (Haryana, Punjab, Uttar Pradesh, Uttarakhand, Bihar, Chandigarh, Delhi, Himanchal Pradesh, Jharkhand, Madhya Pradesh, Rajasthan) within four days. An amount of Rs. 1.20 crores was generated by selling of >2000q seed of IIWBR varieties to the farmers during October, 2022.

During 2020-21 to 2022-23, 37278 farmers were registered and 26862 farmers collected truthfully labled (TL) seeds of DBW 327 (Karan Shivani), DBW 332 (Karan Aditya), DBW 303 (Karan Vaishnavi), DBW 187 (Karan Vandna) DBW222 (Karan Narendra), DDW 47, DWRB 137 and DWRB 137. During this period, revenue generation worth Rs 192.30 was generated through sale of TL seed. Total revenue generation through breeder and TL seed was Rs 12.61 crore.





## Build supply chain of industrial biotech: experts at CSIR-NIIST meet

March 18, 2023

India should focus on building an efficient supply chain to bolster the country's competence in industrial biotechnology, according to panellists at a thematic session at CSIR- National Institute for Interdisciplinary Science and Technology (NIIST) here.

Opening the session on 'Prospects of industrial biotechnology, Dr Anjan

Ray, Director, CSIR-Indian Institute of Petroleum (IIP), said new technologies, products, and services should always form a better alternative to the existing support systems.

Also, performance, large-scale availability, affordability, user comfort, and sustainability should be ensured when a product, process or service is developed.

The session, titled Jaiva, was one of the segments of the One Week One Lab (OWOL) programme, launched by the Government of India to showcase the achievements of the constituent laboratories of Council of Scientific and Industrial Research (CSIR) across the country.

Stressing the need to scale up opportunities and creation of efficient supply chains for ensuring the market,



Dr Anjan said currently the country imports 350 million tonnes of carbon atoms every year while 500 million tonnes is wasted. By deploying industrial biotechnology this could be converted into useful products.

Speaking on the significance of bio-economy, Y B Ramakrishna, Former Chairman, Working group on bio-fuels, MoPNG, suggested the government policies should focus on ensuring nutritional security. With community participation, wasted resources like food grains, land, and municipal solid waste can be utilised for cultivating protein-rich crops, edible oil, and fodder. As India is rich in biomass resources, the R&D activities of CSIR-NIIST should give greater attention on developing technologies for converting biomass into useful products, he noted.

Presiding over the session, Dr C Anandharamakrishnan, Director, CSIR-NIIST, Thiruvananthapuram, said the OWOL programme is aimed

at making the technologies developed by CSIR-NIIST available to stakeholders. Also, the deliberations at the event will help the institute develop technologies needed for the future requirements of society, he added.

Dr Ashok Kumar Dubey, Senior Scientist, Lead-Nutrition and Biosciences, Tata Chemicals Ltd Innovation Centre, spoke on converting biomass into fuel and chemicals. Dr Rajeev K Sukumaran, Senior Principal Scientist, CSIR-NIIST moderated the session.

Mr Yugal Raj Jain, Co-Founder, altM, Bengaluru and Dr Girish Mahajan, Senior Vice President-Microbial Division, Himedia Laboratories Pvt Ltd, Mumbai joined a session on Biopolymer and biomaterials, moderated by Dr Binod Parameswaran, Principal Scientist, MPTD, CSIR-NIIST.

Mr Ranjit and Mr Sreenath of Adobe Biotech India Pvt Ltd, Dr Rajashree D Kamble, Founder Director, Nour-

ish Foods Tech Private Ltd, and Dr J B Venkatakrishnan, Director, Quavac India Pvt Ltd and Nourish Foods Tech Private Ltd, spoke at a session on Bioprocesses and products.

Dr K Madhavan Nampoothiri, Head of the Department, Microbial Processes & Technology Division, CSIR-NIIST welcomed the gathering while Dr N Ramesh Kumar, Principal Scientist, MPTD, CSIR-NIIST proposed a vote of thanks.

As part of OWOL, CSIR-National Institute for Interdisciplinary Science and Technology (CSIR-NIIST), a constituent laboratory of Council of Scientific and Industrial Research (CSIR), Ministry of Science and Technology, Govt. of India, has organised a series of high-profile seminars featuring top scientists, technocrats and administrators at its campus in Pappanamcode in the city from March 13-18.

**Biotech Express – Life Science Planet for Everyone**

GATE & CSIR-NET	Job Search Tips
Job Alerts	Success Stories
Internship Updates	Entrepreneurship
Research Trends	Special Focus
Career Opportunities	Fests / Event and Conference Updates
Expert Interviews	Competitive Exams

# Director of Jivoule Biofuels selected for Rs 2.5 crore funding by NITI Aayog

Mar 20, 2023



AIC-IIIITH's social startup Jivoule Biofuels, a Hyderabad-based green energy firm, has been selected for Rs 2.5 crore in funding by NITI Aayog under the Atal New India Challenge (ANIC), a flagship programme of the Atal Innovation Mission (AIM).

Jivoule Biofuels will split the funding with Verdant Impact, a Jaipur-based animal husbandry platform. The funds will be distributed once the startups have successfully completed the due diligence procedure.

A big part of achieving UN Sustainable Development Goals (UN SDGs) also included supporting People with Disabilities. Recognizing the efforts of AIC-IIIITH in supporting disabled people, SunQulp Tech has been selected for a grant of Rs 50 lakh from the Biotech Ignition Grant (BIG), the largest early-stage biotech funding programme in India.

BIG is the flagship programme of the Biotechnology Industry Research Assistance Council (BIRAC), Department of Biotechnology.

# The Vial: India's COVID-19 Vaccine Story available on youtube

India's Covid-19 vaccination campaign has proven to be the largest in the world. To shed light on this journey, History TV18 is set to launch a documentary titled The Vial: India's Vaccine Story on March 24, 2023, at 8 pm. The 60-minute documentary has been narrated by actor Manoj Bajpayee.

It features Prime Minister Narendra Modi, Adar Poonawalla (CEO, Serum Institute of India), Bill Gates (co-founder of Microsoft and the Bill & Melinda Gates Foundation), Dr Sumit Agarwal (scientist, ICMR), Dr. Shamika Ravi (public policy expert), among others.

Manoj Bajpayee shares, "India's



Covid-19 vaccine story is a remarkable accomplishment for the country, and we all should be aware as well as proud of it. This film is a tribute to our healthcare

professionals and frontline workers, who produced the vaccines in record time and executed the campaign. I am honoured to be a part of this documentary."

## President Murmu appreciates ICAR- NBF-GR model for livelihood



18th March 2023, Lakshadweep

During her visit to Lakshadweep, the President of India, Smt Droupadi Murmu today, appreciated the efforts of ICAR -National Bureau of Fish Genetic Resources in the livelihood development of Island women. She said that the initiative is a unique venture in which science and societal development are taken up hand in hand with local bioresources.

At an interactive session on 19th March 2023 with the women beneficiaries attached to the community aquaculture units for marine ornamentals, the President was appraised about the concept of the community aquaculture centers and their role in enhancing the income of the women islanders.

The beneficiaries attached with the ICAR-NBFGR's community aquaculture centre, Ms. Haslamathbi, T., Mrs. Sabeena Beegum, U., Mrs. Nisa Soorath, S. M., Mrs. Nafeesath, M. P., Mrs. Amminabi, K. T. P., attended the interaction with the President and requested for expanding the activities of the successful model, for enhancing the income of women islanders.

A germplasm resource centre was established at Agatti, Lakshadweep by the institute, four new marine ornamental shrimps were discovered and captive propagation technology was developed.

The training was provided to the

self-help group clusters, who adopted the simplified technology and the community aquaculture units are being successfully operated for rearing marine ornamental shrimps and fishes. The adaptation of technology resulted in the creation of sustainable livelihood among the local population with a subsistence income.

Being a successful model, the institute is planning to expand its activities by establishing more community aquaculture centres in the other inhabited islands of Lakshadweep for livelihood development.

(Source: ICAR -National Bureau of Fish Genetic Resources, Lucknow)



## Telangana Govt to push pharma, bio-tech start-ups, after making it big in IT

February 26, 2023

Over 400 start-ups pitched in with their ideas to be presented before over a strong audience consisting of representatives of industry and regulators from India and abroad

After making it big in promoting start-ups in Information Technology (IT), Telangana Government is now pushing start-ups in bio-tech, pharma space to drive growth and innovation at all levels of pharma/life sciences industry.

The start-up showcase, organised as part of the initiative to encourage innovation ideas at BioAsia 2023, received a huge response with over 400 start-ups pitching in with their ideas to be presented



chose five start-ups as winners.

The winners were Exobot Dynamics Pvt Ltd (for developing bionic limbs, exoskeletons, and assistive devices for people with disabilities), Lambdagen Therapeutics, Singapore (aims to develop personalised brain tumour myeloid cell-based cancer vaccine), Pratiha Healthkon (solutions in primary health space for managing population screening),

Ramja Genosensor (world's first paper-based device that can detect any infection and antimicrobial resistance in just 90 minutes), and SatyaRX Pharma Innovations (for developing specific expertise in the DNA damage response pathway).

Providing an opportunity According to Jayesh Ranjan, Principal Secretary, Industries & Commerce Department, Telangana, the

start-up showcase was intended to identify and encourage talent and to provide an opportunity for them to connect with industry and other stakeholders.

The government of Telangana enabled the participation of 76 start-ups and provided a platform for them to run shoulders with industry, academia, other governments, and allied industry professionals.

Tech Mahindra sponsored the start-up stage and a cash prize of ₹50,000 was given to the top 5 sponsored by BIRAC, dept of biotechnology, GoI and AWS credits sponsored by Amazon Web Services.

“Our target is to triple the value of pharma - life sciences ecosystem in Telangana from current \$80 billion to \$250 billion by 2030,” K T Rama Rao said.

A B-Hub has been provided to encourage start-ups and to facilitate emergence of some Unicorns by 2030.

While Hyderabad is already a hub for global pharma and life sciences players as the only region with the largest number of US FDA-approved facilities outside the US, a focus on start-ups promotes innovation and compliment and R&D ecosystem in Hyderabad.

before over 2000 strong audience consisting of representatives of industry and regulators from India and abroad.

According to K T Rama Rao, Minister for Industries, IT & Municipal Administration, about 400 entries were received for the showcase, out of which 76 participants hailing from national and international geographies were shortlisted and a jury consisting of Industry experts

# The success story of a budding farm entrepreneur through pig farming



Namrata, an 18-year-old girl from a scheduled caste community is pursuing her higher secondary education. She is incredibly courteous, and her relentlessness in up keeping piggery is quite exceptional.

She started her interest in pig farming by helping her father soon after finishing the 10th standard, where she received a matriculation grade of 87%. She kept nurturing her hobby of farming while pursuing her studies further.

Namrata rears a stock of 2 boars, 4 sows, and 12 growers. During academic breaks, she attended training at ICAR -National Research Centre on Pig, Rani, Guwahati to update her practical knowledge on scientific pig farming and artificial insemination in pigs. She

describes herself as an emerging farm entrepreneur, all during a period when most of those in her generation find this area less appealing.

She has minimized input costs by using locally available rice polish and fish market wastes for feeding the pigs. Ingredients are cooked before feeding. Additionally, she has integrated pig farming with Azolla (*Azolla pinnata*) cultivation. Dried Azolla is incorporated as a nutritional supplement on weekly basis.

Namrata also received farm inputs like a biosecurity kit and farm implements from ICAR-National Research Centre on Pig under the SCSP programme of the institute.

Disinfection and cleaning are routinely performed on her farm. The biosecurity measures prevented the incidence of Africa Swine Fever, which has devastated many nearby farms.

She plans to focus on the breeder facility, where she makes more money.

Last year, she sold 32 piglets, making Rs. 1,44,000 from piglet sales only. Additionally, two finishers were sold for a combined price of Rs 60,000, bringing home more than 2 lakhs in total. Thanks to the financial contribution to her family, she makes independent decisions to continue her studies.

No.: BMI/ePMS/121273

Date: 01/03/2023

**CALL FOR INVESTIGATOR-INITIATED RESEARCH PROPOSALS\* FOR  
SMALL EXTRAMURAL GRANTS**

Communicable Diseases	Non-Communicable Diseases	Reproductive, Maternal and Child Health, Nutrition
One-health	Cancer – breast, cervix, oral, lung	Preconception care
Tuberculosis	Diabetes	Hypertensive disorders of pregnancy
Antimicrobial resistance	Cardio-vascular disease	Gestational diabetes
Malaria	COPD	Intrapartum care
HIV, Sexually Transmitted Infections	Stroke	Postnatal care
Influenza and other Respiratory infections	Epilepsy	Stillbirths
Gastrointestinal infections	Dementia / Alzheimer's disease	Polycystic Ovary Syndrome
Viral Hepatitis	Rheumatic Heart Disease	Endometriosis
Sepsis	Trauma and Burns	Neonatal sepsis
Meningitis/encephalitis	Chronic GE/Liver disease	Perinatal asphyxia
Urinary infections	Chronic Kidney Disease	Preterm birth / low birth weight
Lymphatic Filariasis	Depression, anxiety	Early child development
Kala-azar/Leishmaniasis	Psychosis	Childhood pneumonia, diarrhea, fever
Dengue	Substance Use Disorders	Breastfeeding and Complementary Feeding
Helminth Infestation	Oral health	Childhood malnutrition
Measles, Rubella	NCD risk factors – diet, activity, alcohol, tobacco	Anaemia in women and children
Rickettsia infections (including scrub typhus and non-scrub typhus rickettsia)	Sickle Cell Disease / Thalassemia	Adolescent nutrition
COVID-19	Clotting disorders	Nutrition in acute/chronic disease

For any queries related to the call, please contact - Dr. Lokesh Sharma, Email: po.epms@icmr.gov.in

**Last date for submission of proposal: 28-April-2023**



जैव प्रौद्योगिकी विभाग  
**Department of Biotechnology**  
Ministry of Science & Technology  
Government of India



EUROPEAN UNION

## ANNOUNCEMENT INDIA-EU COOPERATION ON RESEARCH & INNOVATION (R&I)

### DBT ANNOUNCES CO-FUNDING PARTNERSHIP UNDER THE EU FRAMEWORK PROGRAMME ON R&I 'HORIZON EUROPE' CALLS 2023-2024

Collaboration in Science, Technology and Innovation (STI) plays an increasingly important role in the EU-India Strategic Partnership. In line with the EU-India Strategic Partnership: A Roadmap to 2025, and the Joint Science and Technology Steering Committee meeting on 12 February 2021, the Department of Biotechnology (DBT), has identified calls for proposals in the Work programmes 2023-2024 of the EU R&I Research and Innovation Programme 'Horizon Europe', which it considers of mutual interest and aiming at jointly tackling global challenges.

For this, DBT has established a mechanism outlining the conditions upon which it will co-fund the successful Indian entity/ies and in which call topics (hereafter Co-Funding Mechanism or CFM). The CFM will apply to the call topics earmarked by DBT in areas of pandemic preparedness and response, brain disorders, biofuels and healthy & environmentally-friendly food.

All proposals have to be submitted to both the Horizon Europe Funding & Tenders Portal and to DBT. The EU will only evaluate the proposal submitted to its portal. DBT expects to receive the same copy with in addition all details on the budget the Indian entity requires for its participation. Budget information to be provided in prescribed format and in Indian Rupees. In the absence of this, DBT will disqualify the Indian participants from funding

For the complete call text click Horizon Europe Funding & Tenders Portal including the general conditions and modalities, and in particular the specific call conditions on the given call topic. Please read carefully the call text itself, which is the only legally binding text.

**Closing Deadline: 13 Apr 2023**



# EMBO Events

# 2023

## Practical Courses

- CL-Valparaiso | 4–16 January 2023 | R. Mayor  
**Developmental biology**
- DE-Heidelberg | 12–17 February 2023 | M. Schorb  
**In-situ CLEM at room temperature and in cryo**
- DE-Heidelberg | 5–10 March 2023 | M.D. Vianco  
**Techniques for mammary gland research**
- DE-Heidelberg | 12–17 March 2023 | A. Hendrix  
**Extracellular vesicles: From biology to biomedical applications**
- IT-Proxida | 13–19 March 2023 | V. Colonna  
**Population genomics: Background and tools**
- DE-Heidelberg | 26 March–1 April 2023 | J. Medenbach  
**Measuring translational dynamics by ribosome profiling**
- DE-Heidelberg | 17–24 April 2023 | J.E. González-Pastor  
**Microbial metagenomics: A 360° approach**
- GR-Heraklion | 7–18 May 2023 | A. Stamatakis  
**Computational molecular evolution**
- DE-Heidelberg | 11–16 June 2023 | C. Ludwig  
**Quantitative proteomics: Strategies and tools to probe biology**
- DK-Odense | 15–22 June 2023 | M.R. Larsen  
**Characterisation of post-translational modifications in cellular signalling**
- ES-Barcelona | 18–23 June 2023 | J. Sharpe  
**Computational modelling of multicellular systems**
- Hybrid** | CZ-Prague | 18–23 June 2023 | J. Novotny  
**Super-resolution in light microscopy**
- IT-Monterotondo | 25–30 June 2023 | A. Crevenna  
**Imaging-based spatial-omics**
- Hybrid** | DE-Heidelberg | 16–21 July 2023 | J. Crocker  
**Drosophila genetics and genomics**
- DE-Heidelberg | 24 July–4 August 2023 | A. Aulehla  
**Plasticity in developing systems: Time, space and environment**
- DE-Magdeburg | 4–15 September 2023 | S. Mikulovic  
**LINDscope: Neuroimaging and data analysis**
- UK-London | 5–12 September 2023 | G. Zanetti  
**Image processing for cryo-electron microscopy**
- Hybrid** | DE-Heidelberg | 10–15 September 2023 | C. Tischler  
**Advanced methods in bioimage analysis**
- TR-Izmir | 17–22 September 2023 | E. Karaca  
**Integrative modelling of protein interactions**
- Hybrid** | DE-Heidelberg | 22–27 October 2023 | E. Perlas  
**FISHing for RNAs: Classical to single molecule approaches**
- ES-Barcelona | 12–17 November 2023 | E. Sabido  
**Targeted proteomics: Experimental design and data analysis**
- FR-Ilkirsch | 19–25 November 2023 | A. Poterszman  
**Preparation and biophysical/MS characterization of multiprotein complexes for cryo-EM analysis**

## Workshops

- IL-Rehovot | 8–12 January 2023 | M. Sharon  
**The 20S proteasome degradation pathway**
- IN-Goa | 6–10 February 2023 | A. Badrinarayanan  
**Bacterial morphogenesis, survival and virulence: Dynamic genomes & envelopes**
- Hybrid** | DE-Heidelberg | 8–11 February 2023 | J. Mahamid  
**In-situ structural biology: From cryo-EM to multi-scale modelling**
- IL-Rehovot | 28 February–3 March 2023 | R. Sorek  
**Immune system of bacteria (SISB2023)**
- IL-Kibbutz Nahsholim | 11–14 March 2023 | M. Oren-Suisa  
**Mechanisms of neuronal remodeling**
- IL-Rehovot | 13–16 March 2023 | S. Wolf  
**Visualising the complex dynamics of biological membranes**
- Hybrid** | CL-Valparaiso | 15–19 March 2023 | A. Calloto  
**Third Latin American C. elegans meeting**

- CL-Santa Cruz | 26–30 March 2023 | C. Leterrier  
**Emerging concepts of the neuronal cytoskeleton**
- Hybrid** | DE-Heidelberg | 28–31 March 2023 | B. Kozliková  
**Visualizing biological data (VIZBI 2023)**
- Hybrid** | FR-Les Houches | 9–14 April 2023 | P.H. Puech  
**ImmunoBiophysics: From fundamental physics to understanding the immune response**
- Virtual** | HU-Pecs | 17–19 April 2023 | S. Kapetanaki  
**Time-resolved spectroscopy meets time-resolved crystallography: The future of dynamic photobiology**
- DE-Seeon | 23–27 April 2023 | M. Conrad  
**Ferroptosis: When metabolism meets cell death**
- Hybrid** | ES-Sant Feliu de Guixòls | 24–27 April 2023 | E. Martí  
**Hedgehog signalling: From molecular structure to developmental biology and diseases**
- GR-Heraklion | 8–11 May 2023 | G. Tavosanis  
**Cell biology of the nervous system: Long-term regulation and vulnerability**
- PL-Poznan | 15–18 May 2023 | B. Uszczyńska-Ratajczak  
**Non-coding RNA medicine**
- ES-Sant Feliu de Guixòls | 21–25 May 2023 | M. Loose  
**Cell polarity and membrane dynamics**
- HR-Srebreno | 21–26 May 2023 | E. Weber-Ban  
**Protein quality control: From molecular mechanisms to therapeutic intervention**
- HR-Cavtat | 23–26 May 2023 | O. Riesland  
**RNA meets protein decay**
- GR-Alexandroupoli | 25–28 May 2023 | F.G. Grosveld  
**Systems biology: Linking chromatin and epigenetics to disease and development**
- CH-Montreux | 18–22 June 2023 | S. Nef  
**European testis workshop 2023**
- Hybrid** | AT-Pamhagen | 18–23 June 2023 | V. Jantsch  
**Melosis**
- Hybrid** | DE-Berlin | 19–22 June 2023 | E. Schulz  
**X-chromosome inactivation: New insights on its 60th anniversary**
- Hybrid** | CZ-Brno | 20–23 June 2023 | Š. Valskřová  
**Eukaryotic RNA turnover and viral biology**
- HR-Split | 26–30 June 2023 | I. Staiglar  
**Systems approaches in cancer**
- ES-Girona | 27 June–1 July 2023 | S. Roalijäskers  
**Antibodies and complement: Effector functions, therapies and technologies**
- CH-Lugano | 28–30 June 2023 | S. Fernandez Gonzalez  
**Imaging the immune system (IIS)**
- DE-Dresden | 3–7 July 2023 | O. Campas  
**Physics of living systems: From physical principles to biological function**
- Hybrid** | DE-Heidelberg | 11–14 July 2023 | J. Crocker  
**Predicting evolution**
- Hybrid** | DK-Copenhagen | 6–10 August 2023 | J. Nilsson  
**Signal regulation by protein phosphatases: Mechanisms and pathways**
- CH-Les Diablerets | 3–7 September 2023 | J. Baxter  
**DNA topology and topoisomerases in genome dynamics**
- ES-Alicante | 7–10 September 2023 | V. Tiwari  
**Gene regulatory mechanisms in neural fate decisions**
- IT-Venice | 10–15 September 2023 | S. Sigismund  
**When biology of endocytosis meets physics: Emerging mechanisms and functions**
- Hybrid** | DE-Heidelberg | 12–15 September 2023 | A. Aulehla  
**Developmental metabolism: Flows of energy, matter and information**
- ES-Sant Feliu de Guixòls | 17–22 September 2023 | B. Schrul  
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**Centrosomes in development, disease and evolution**

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**Computational structural biology**

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**Membrane shaping and remodeling by proteins**

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**The cellular mechanics of symbiosis**
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- Hybrid** | DE-Heidelberg | 9–12 May 2023 | D. Arendt, E. Heard, M. Leptin, F. Watt, D. Weigel  
**The organism and its environment**
- Hybrid** | DE-Heidelberg | 4–7 June 2023 | J. Jacobs, G. Legube, B. Luke, B. Schumacher  
**The ageing genome: From mechanisms to disease**
- Hybrid** | DE-Heidelberg | 12–15 June 2023 | A. Muñoz, Z. Gital, KC Huang, E. Paluch  
**Life at the periphery: Mechanobiology of the cell surface**
- Hybrid** | DE-Heidelberg | 27–30 June 2023 | P. Cossart, S. Helaine, KC Huang, M. Laub, N. Typas  
**New approaches and concepts in microbiology**
- Hybrid** | DE-Heidelberg | 18–21 July 2023 | A. Aulehla, J. Garcia-Ojalvo, R. Phillips, K. Wan  
**Theory and concepts in biology**
- Hybrid** | DE-Heidelberg | 20–23 September 2023 | M. Arumugam, A. Bhatt, P. Bork, N. Segata  
**The human microbiome**
- Hybrid** | DE-Heidelberg | 4–7 October 2023 | J. Ellenberg, J. Lippincott-Schwartz, S. Mayor, A. Miyawaki  
**Seeing is believing: Imaging the molecular processes of life**
- Hybrid** | DE-Heidelberg | 11–14 October 2023 | M. Buhler, A. Eulálio, J. Mendell, G. Storz, I. Ulitsky  
**The non-coding genome**
- Hybrid** | DE-Heidelberg | 18–21 October 2023 | M. Huch, K. Koehler, M. Lancaster, E. Schnapp  
**Organoids: Modelling organ development and disease in 3D culture**

## Lecture Courses

- EMBO | FEBS Lecture Course**  
DE-Ingelheim am Rhein | 3–6 October 2023 | C. Muench  
**Susan Lindquist school on proteostasis**
- EMBO Lecture Course**  
IT-Venice | 21–25 August 2023 | J. Jaeger  
**Venice Summer School: The future of evolutionary-developmental systems biology**
- India | EMBO Lecture Courses**  
**Hybrid** | IN-Pune | 30 January–3 February 2023 | A. Sahu  
**Complement in kidney diseases**
- IN-Bangalore | 6–9 February 2023 | S. Tole  
**Modeling development and disease with human tissue organoids**
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**Tumour metabolism: Current understanding and opportunities for novel drug discovery**

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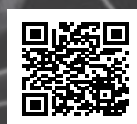
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