

CSIR IN MEDIA



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CSIR

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06 TO 10 FEBRUARY 2024



CSIR NAL flies test-drone that can double up as ‘pseudo satellite’

CSIR-NAL

10th February, 2024

Scientists at the CSIR-National Aerospace Laboratories (NAL) have successfully tested an unmanned aerial vehicle, called High Altitude Pseudo Satellite (HAPS) at Challakere, Karnataka, earlier this month. HAPs are like drones, except that they are expected to be in the stratosphere – well above where commercial planes fly – and can be powered enough by solar cells and a battery-system to be able to hover for days on end. A fully working HAPS can be used for a variety of applications, from surveillance to beaming 5G waves. They can double up as “towers in the sky” and have more flexibility than satellites, in being able to map a piece of land from above.

The NAL system is currently far from these goals. The HAPS that was flown this month is a scaled-down HAPS. The 5-metre-long system, with a wingspan of 11 metres and weighing 23 kg, rose to about 3 km and stayed put for about eight hours. This prototype, scientists associated with the project told The Hindu, “met or exceeded all the performance metrics set out for it.” However a series of tests have been planned and they are expected to culminate in a full-bodied craft – with a wingspan of 30m (nearly as much as a Boeing 737) – by 2027. It will be able to rise to 23 km and stay airborne for at least 90 days. “There are very few proven systems anywhere in the world that can do this and given the variety of potential applications, India ought to be able to have such capabilities of its own,” said Abhay Pashilkar, Director, CSIR-NAL.

While HAPS may look elementary, it requires a fair bit of engineering prowess. They are unmanned and must fly days and nights on end, meaning they need solar-powered batteries – and not jet fuel - capable of lifting the airframe up to the stratosphere (which extends from 6-50 km above the earth’s surface). This ascent into the sky is challenging, given the air turbulence in the atmosphere, and the fact that these are relatively light planes. “The weight of the airframe is only 8 kg but the entire system’s weight is nearly 23 kg. Most of the weight is

of the batteries,” said Dr. Pashilkar. Unlike the familiar solar panels on rooftops, those used to power the plane are extremely thin solar films. “There are only one or two companies in the world capable of making solar-cell films that thin,” said L. Venkatakrishnan, Chief Scientist and Head, NAL, and in-charge of the HAPS programme. “It’s like the Hero Honda of the skies. Our test this month gave us the information required to design a bigger system, particularly on how can we ensure that the drone remains balanced given the forces it will be subject to,” he told The Hindu.

CSIR-NAL aims to design and build the HAPS’ propellers, battery management system, carbon-composite airframe, flight-control system, and the high-powered electric motors that can withstand extreme temperature ranges.

Last month, in an unrelated project, Bengaluru-based private company, NewSpace Research and Technologies Pvt. Ltd. (NRT) reported carrying carried out the first test-flight of a solar-powered, long-endurance drone that flew for 21 hours. This was part of a demonstration project funded by the Defence Ministry. However details of the height achieved by the plane and whether it carried a payload isn’t publicly known.

CSIR-NIScPR Celebrates the Foundation Day

CSIR-NIScPR

09th February , 2024



The Council of Scientific and Industrial Research-National Institute of Science Communication and Policy Research (CSIR-NIScPR) celebrated its Foundation Day with a dynamic event showcasing a commitment to advancing science communication, STI policy research, innovation, and research. The institute, under the directorship of Prof. Ranjana Aggarwal, marked the occasion with significant events and collaborative endeavours.

Prof. Yogesh Singh, Vice Chancellor of the University of Delhi and Member of CSIR Society, was the Chief Guest of the Foundation Day Programme. Prof. Singh delivered an inspiring Foundation Day Lecture on "Rising India: Future of India." He appreciated CSIR-NIScPR's vision to become a globally respected think tank and resource center for policy research, innovation, and science communication. Prof. Singh emphasized the integral role of science communication in India's journey towards becoming a Vikasit Bharat.

Prof. Ranjana Aggarwal, Director of CSIR-NIScPR, emphasized the institute's dedication to disseminating scientific achievements in all Indian languages. Highlighting the new initiatives of the Institute, Prof. Aggarwal mentioned the concrete outcomes of the Science Media

Communication Cell, SVASTIK, Technology Readiness Level efforts and many others. She also emphasised the strong focus on language diversity as a means to reach a wider audience. Prof. Aggarwal shared insights into the institute's prominent role as the host of the National Science Library, the largest in Asia.

Key deliberations out of the address by the Director CSIR-NIScPR: Science Media Communication Cell (SMCC) is an innovative initiative bridging the gap between media and science. This cell is designed to enhance the communication of scientific achievements to the public, fostering a better understanding of S&T knowledge to society. NETRA Framework has been developed in collaboration with National Research Development Corporation (NRDC) for assessing technology readiness levels. CSIR-NIScPR will play a pivotal role in certifying technologies for the NRDC, further supporting technological advancements. Prof. Aggarwal highlighted the institute's commitment to creating rural livelihoods by leveraging CSIR technology. This initiative will utilize the networks of the Unnat Bharat Abhiyan and Vijnan Bharati, aiming to empower rural communities through innovation. In line with Prime Minister Modi's vision, SVASTIK seeks to disseminate scientifically validated traditional knowledge of India. This initiative reflects CSIR-NIScPR's dedication towards preserving and promoting traditional wisdom.

Dr. Anil Kothari, Director General of M.P. Council of Science & Technology, Bhopal, expressed the importance of CSIR-NIScPR becoming a centralized platform for scientific information and Dr. Sudesh Kumar Yadav, Director of CSIR-Institute of Himalayan Bioresource Technology, Palampur, participated in the release of CSIR-NIScPR publications and signing of MoUs, including brochures and Svastik's communication on the dissemination of traditional knowledge.

The event was compered by Dr. Manish Moharn Gore, Scientist at CSIR-NIScPR, and concluded with a vote of thanks proposed by Dr. Charu Verma, Chief Scientist and Chairperson, Foundation Day Celebrations Committee, CSIR-NIScPR looking forward to a future marked by impactful collaborations, advancements in science communication, STI

policy research and meaningful contributions to India's scientific landscape.

About CSIR-NIScPR

CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR) is one of the constituent laboratories of the Council of Scientific & Industrial Research (CSIR) under the Ministry of Science & Technology, Government of India. It specializes in the fields of science communication; STI focused evidence-based policy research and studies. It publishes various journals, books, magazines, newsletters, and reports on science and technology. It also conducts research on science communication, science policy, innovation systems, science-society interface, and science diplomacy.

For more information, please visit <https://niscpr.res.in/> or follow us at Twitter: @CSIR_NIScPR Facebook: CSIR NISCPR-OFFICIAL PAGE Instagram: csr_niscpr

CSIR is implementing Mission Mode project for developing indigenous electrolyzers: Union Power and New & Renewable Energy Minister

CSIR

09th February, 2024

The Union Minister for New & Renewable Energy and Power has informed about the steps taken by the Government to provide guidance for developing a vibrant research and development ecosystem which can help commercialization of Green Hydrogen.

The Ministry of New and Renewable Energy is implementing the National Green Hydrogen Mission, launched by the Government in January 2023. The overarching objective of the Mission is to make India the Global Hub for production, usage and export of Green Hydrogen and its derivatives.

The following components have been announced as part of the Mission:

Pilot Projects for steel, mobility, shipping, decentralized energy applications, hydrogen production from biomass, hydrogen storage, etc. with an outlay of Rs. 1,466 crores;

Research & Development programme including through a public-private partnership framework for R&D with an outlay of Rs. 400 crores.

The Research and Development roadmap for the Mission has been released on 7th October 2023, which outlines the important research areas in this field.

Council of Scientific & Industrial Research (CSIR) is implementing a Mission Mode Project, with an outlay of Rs. 75 crores, to develop different types of indigenous electrolyzers, namely Anion Exchange Membrane (AEM) electrolyser, Proton Exchange Membrane (PEM) electrolyser, and Solid Oxide Electrolyser (SOE) electrolyzers; Fuel Cells and Hydrogen Storage Cylinders. The emphasis is on making the electrolyzers and fuel cells with efficiency comparable to global benchmarks.

Department of Science & Technology (DST) has supported the Hydrogen and Fuel Cell program with an objective to promote and support activities related to the indigenous development of materials, catalysts, membrane, components for fuel cells, electrolyzers, hydrogen storage materials, materials for type IV cylinders and prototypes for implementation of various applications of hydrogen and fuel cell in the country.

This information has been given by the Union Minister for New & Renewable Energy and Power Shri R. K. Singh, in a written reply to a question, in Lok Sabha.

India's National Aerospace Laboratories conducts HAPS flight tests

CSIR-NAL

08th February, 2024

India's Council of Scientific and Industrial Research – National Aerospace Laboratories (CSIR-NAL) has carried out a series of flight tests on a subscale model of its high-altitude pseudo satellite (HAPS) platform.

The tests were conducted at the Defence Research and Development Organisation's (DRDO's) Aeronautical Test Range (ATR) at Challakere, Karnataka, from 23 January to 2 February. During the tests, the subscale model, which has a wingspan of 12 m and a maximum take-off weight of 22 kg, conducted about 22 sorties and accumulated close to 37 flight hours.

Speaking to Janes, L Venkatakrishnan, NAL's chief scientist and high-altitude platform programme director, said, “The aircraft met or exceeded all the performance metrics set out for it including a flight endurance of more than 8 hours 30 minutes, reaching an altitude of almost 3 km above mean sea level.” Venkatakrishnan added that metrics including climb rate, maximum bank angle, turn radius, and one engine inoperative were also assessed in the flight tests. In undertaking the tests, NAL has achieved a deliverable under its HAPS project to “demonstrate a Reynolds number [which indicates the ratio of inertial forces to viscous forces] equivalent flight at an altitude of 3 km”, Venkatakrishnan said.

The tested HAPS model was equipped with the payloads and flight systems required on a full-scale platform. It was also fitted with a pair of cameras (forward looking and on the tail) to observe in-flight performance. Fitted with high-performance solar photovoltaic cells, a battery system – and a payload of 1 kg – the subscale model can reach a 24-hour endurance flight, making it useful for low-altitude missions, Venkatakrishnan said.

Published in:

[Janes](#)

ट्यूलिप गार्डन का दीदार करना है तो आइए पालमपुर, मन मोह लेगी 6 किस्मों की 50 हजार फूलों का दृश्य

CSIR-IHBT

08th February , 2024

सीएसआईआर-आईएचबीटी संस्थान पालमपुर में खिले ट्यूलिप फूल कश्मीर का एहसास दिला रहे हैं. इन दिनों बड़ी संख्या में ट्यूलिप गार्डन का दीदार करने पर्यटक पहुंच रहे हैं. यहां 6 किस्मों के 50 हजार ट्यूलिप के फूल लगाए गए हैं. ट्यूलिप गार्डन का जिक्र आते ही सबसे पहले जम्मू-कश्मीर का नाम जेहन में आता है, लेकिन अब आप हिमाचल प्रदेश के पालमपुर में भी ट्यूलिप गार्डन का दीदार कर सकते हैं. यहां सीएसआईआर-हिमालय जैवसंपदा प्रौद्योगिकी संस्थान पालमपुर में 6 किस्मों के 50000 ट्यूलिप के पौधे लगाए गए हैं. जिसका नजारा बहुत ही अद्भुत है. इस ट्यूलिप गार्डन को देखने के लिए अब देश के कई हिस्सों से पर्यटक देखने आ रहे हैं.



सीएसआईआर-हिमालय जैवसंपदा प्रौद्योगिकी संस्थान पालमपुर में ट्यूलिप गार्डन की सुंदरता को निहारने के लिए बड़ी संख्या में पर्यटक पहुंचने लगे हैं. कश्मीर के बाद अब पालमपुर में देश का दूसरा ट्यूलिप गार्डन हिमालय जैव संपदा प्रौद्योगिकी संस्थान द्वारा विकसित किया गया है. यह ट्यूलिप गार्डन पूरी तरह से स्वदेशी ट्यूलिप पौधे से विकसित किया गया है. ट्यूलिप हॉलैंड में बहुतायत में पाया जाता है. इस पुष्प का गहरा रंग और सुंदर आकार लोगों को आकर्षित करता है. यह अपनी समरूपता के लिए विश्व भर में विख्यात है. इसकी कई खूबसूरत प्रजातियां हैं.

सीएसआईआर-आईएचबीटी संस्थान पालमपुर में 6 किस्मों के 50000 ट्यूलिप के पौधे) लगाए हैं. सीएसआईआर-हिमालय जैवसंपदा प्रौद्योगिकी संस्थान पालमपुर के निदेशक डॉ. सुदेश कुमार यादव ने इस बारे में जानकारी दी. उन्होंने कहा ट्यूलिप गार्डन के माध्यम से ट्यूलिप फूल को बढ़ावा देने के प्रयास किए जा रहे हैं और सीएसआईआर फ्लोरी क्लचर मिशन के तहत इस को फूल बढ़ावा दिया जा रहा है. यह प्राकृतिक सुंदरता को बढ़ाता है. पर्यटक दूर-दूर इसकी सुंदरता

को देखने के लिए आते हैं, बल्कि ट्रिज्म को बढ़ावा देने सहायक सिद्ध हो रहा है. डॉ. सुदेश कुमार यादव ने कहा यहां पर 6 किस्मों के 50 हजार बल्ब (पौधे) लगाए गए हैं. सीएसआईआर-हिमालय जैवसंपदा प्रौद्योगिकी संस्थान पालमपुर के वरिष्ठ वैज्ञानिक डॉ. भव्य भार्गव ने कहा ट्यूलिप गार्डन का यह तीसरा वर्ष है. इस बार ट्यूलिप की 6 किस्मों के 50 हजार के पौधे लगाए गए हैं. 50 किसान ट्यूलिप का कार्य कर रहे हैं. प्रदेश के लाहौल स्पीति जिला के जुड़े हुए हैं. पिछले वर्ष लेह लद्दाख और कारगिल में ट्यूलिप का ट्रायल किया गया था, जो सफल रहा है. इस वर्ष मंडी और शिमला के ऊपरी क्षेत्रों में ट्यूलिप का ट्रायल शुरू किया जा रहा है.

डॉ. भव्य भार्गव ने कहा देश में ट्यूलिप का आयात हॉलैंड से किया जाता है और 22 जनवरी को श्री राम मंदिर के उद्घाटन समारोह के लिए ट्यूलिप के फूलों अयोध्या भेजा गया था. ट्यूलिप की काफी मांग है. यहां सौ रुपये का एक ट्यूलिप बिक रहा है. ट्यूलिप गार्डन देखने आए हुए पर्यटकों ने कहा कि उन्हें यहां आकर बहुत अच्छा लग रहा है. पहले ट्यूलिप गार्डन को देखने के लिए श्रीनगर जाना पड़ता था. संस्थान द्वारा बहुत सराहनीय कार्य किया गया है.

CSIR-NIIST in Kerala transfers enzyme technology to industry for production of biofuels

CSIR-NIIST

07th February, 2024

The National Institute of Interdisciplinary Science & Technology (CSIR-NIIST), a constituent laboratory of the Council of Scientific and Industrial Research (CSIR) based here, has entered into a technology transfer agreement with a Maharashtra-based company for commercial production of beta glucosidase enzyme used by the biofuel industry.

The institute has signed an agreement with Sarthak Metals Ltd, Nagpur, Maharashtra, for transfer of the technology. As per the agreement, the CSIR-NIIST will grant licence to Sarthak Metals Ltd for utilising the know-how for production of beta glucosidase using filamentous fungus through solid state fermentation (SSF) process. The enzyme can be used in biofuel production, particularly for the hydrolysis of biomass in combination with cellulases as an enzyme cocktail.

Spurt in demand

The transfer of the technology for commercial use assumes significance considering the spurt in demand for cellulose cocktail in the wake of the Government of India clearing several 2G ethanol projects, said NIIST director C. Anandharamakrishnan.

The BGL enzyme has been found to increase the efficiency of the fermentation process by up to 30% when tested in blend along with acid cellulose and commercial enzyme preparations in bio refineries.

It also has applications across industries, including textiles, detergents and in organic synthesis.

Published in:

[The Hindu](#)

Union Minister Dr Jitendra Singh launches the theme for National Science Day 'Indigenous Technologies for Viksit Bharat'

CSIR

06th February, 2024

Union Minister of State (Independent Charge) Science & Technology; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, Dr Jitendra Singh today released the theme for the "National Science Day 2024", titled "Indigenous Technologies for Viksit Bharat".

The NSD Theme for this year's celebration reflects a strategic focus on promoting public appreciation for Science, Technology and Innovation and accomplishments of Indian scientists to address challenges through home-grown technologies for over-all well-being.

The Theme not only marks a new era but also presents an opportunity for public and scientific fraternity, both domestically and internationally, to collaborate, work together, and contribute to the well-being of India and humanity as a whole. While emphasizing the importance of making India Atmanirbhar through science, it underscores the need to address subjects that hold significance for humanity as a whole.

The National Science Day (NSD) is celebrated every year on 28 February to commemorate the discovery of the 'Raman Effect'. Government of India designated 28 February as National Science Day (NSD) in 1986. On this day Sir C.V. Raman announced the discovery of the 'Raman Effect' for which he was awarded the Nobel Prize in 1930. On this occasion, theme-based science communication activities are carried out all over the country. The theme launch will trigger celebrations of NSD specially in schools & colleges throughout the country.

In the wake of recent scientific achievements, it may be underscored that the rising trajectory of India over past 10 years is being witnessed globally. We are globally among the top five countries in scientific research publications, 40th in Global Innovation Index (GII) showcasing remarkable climb from 81st rank in 2015 and our patent filing has crossed 90,000 which is highest in two decades.

All this is due to strengthening of S&T ecosystem in the nation in fields such as Artificial Intelligence, Astronomy, Solar & Wind Energy, Semiconductors, Climate Research, Space Research and Biotechnology. Indian scientific breakthroughs have reached from the lab to moon; with the successful landing of Chandrayaan-3 on south pole of moon, India became the first country to achieve this feat.

India is also acknowledged for robust vaccine development capacity, and it has been proved during COVID pandemic. India is now ready to match the global stride in Quantum Technology. The impact of Indian scientific breakthroughs is significantly enhancing the 'Ease of Living' for the common man.

Professor Abhay Karandikar, Secretary DST in his welcome address said that as we embark on the celebration of NSD and move ahead with the launch of the theme for 2024, it is clearly evident that our scientific endeavours have the power to shape not only the future of our nation but also contribute significantly towards global advancement.

“As the scientific community from the States S&T Councils have also joined for the launch of NSD Theme, I must say that together we can create an ecosystem that encourages scientific inquiry and collaboration across the nation to leverage the transformative power of science for the greater good,” he added.

Dr Rajesh Gokhale, Secretary, Department of Biotechnology (DBT), Dr Kalaiselvi, DG-CSIR, Dr. Rashmi Sharma, Head, NCSTC, DST and other Senior officials of the Ministry of Science and Technology took part in today's event.

CSIR-CDRI & TETC India will organize symposium on career development in biological & biomedical sciences

CSIR-CDRI

06th February, 2024

The CSIR-Central Drug Research Institute (CSIR-CDRI) in collaboration with Trust for Education and Training in Cytometry (TETC), India, is organizing a Symposium on Career Development in Biological & Biomedical Sciences on 6th February and Silver Jubilee 25th INDO-US Flow Cytometry Workshop on “Flow Cytometry and its Advanced Applications in Biological Sciences on 7th and 8th February 2024.

The event will serve as a crucial platform for students, technologists, postdoctoral scholars, scientific officers, faculty, and professionals in non-academic sectors, by providing invaluable insights into diverse career paths within the biological and biomedical sciences.

The symposium, will cover various topics vital for career development, featured lectures and panel discussions on Entrepreneurship, Company, NGO & Start-up, Funding/Grant Opportunities, Scientific Positions in R&D, Opportunities in Corporates & Government Organizations, Careers in Flow Cytometry, and Postdoctoral Opportunities.

Esteemed speakers from diverse backgrounds will share their expertise, contributing to the symposium's success. Notable figures included Dr. Sanjeev Kumar Varshney, Advisor & Head, International Cooperation DST, GOI, New Delhi; Dr. Arvinder Singh, Director, Human Diagnostics, Gurgaon; Dr. Hemant Agrawal, Director, Flow Cytometry Solutions, Jaipur; Dr. Saman Habib, Chief Scientist at CSIR-CDRI, Lucknow; Dr. Naibedya Chattopadhyay, Chief Scientist at CSIR-CDRI, Lucknow; Dr. Michael D'Silva, Lead Investigator at Syngene International, Bangalore; Mr. Ayush Mishra, Chief Innovation and Operations Officer at Anervea, Pune; and Dr. Rekha Gour, Co-Founder, TETC, India.

The major talks during the symposium would be focused on Scientific Positions in Government Institutes and Corporate R&D. Another highlight of the event would be the

recognition of excellence in research through the TETC Best Published Paper Award 2024. In the evening of symposium, a panel discussion will provide the opportunity to the participants to interact with the speakers, gaining valuable insights and advice for their career journeys.

On 7th February the Silver Jubilee 25th INDO-US Flow Cytometry Workshop would be initiated in which the participants will sharpen their skills of Flow Cytometry. These workshops were initiated in 2002 and since then the mission of building a cytometry community is successfully continued by TETC in collaboration with leading research Institutes, Hospital, Universities and other academic organizations throughout India.

The road from 8% to 67% plastic recycling rate in India

CSIR-NEERI

06th February, 2024

India's plastics recycling rate stood at 8% in 2019. The country generates nearly 26,000 tonnes of plastic waste every day, more than any economy except the United States and the European Union.

In an effort to build a circular plastics economy in India, a consortium of Indian and Australian research organisations has developed a roadmap to 2035 including a comprehensive view of the entire plastics value chain and systemic policy recommendations.

The team set a goal of recycling 67% of plastic waste by 2035, with an annual consumption of 52.9 million tonnes. To achieve this and other circular economy targets, seven types of policy will be needed: supportive infrastructure, effective recycling, consistent compliance, sustainable consumption, awareness and readiness, design for circularity, and commercial viability.

The researchers argued that radically improving India's recycling capacity will require government-finance-research-industry collaboration. Mechanical and chemical recycling will both play a role, they said, as will artificial intelligence, reverse logistics, and smaller-scale community-based solutions.

According to the roadmap, plastics recycling and sorting infrastructure has to be in place already by 2025. The academics suggest hosting a National Expo of Technologies to promote the 'Make in India' campaign. By 2030, recycling capacity should grow to 18.8 million tonnes and digitalisation of the flow chain of polymers should be mandatory. By 2025, recycling capacity should hit 35.2 million tonnes and digital product certification and traceability from cradle to grave should be in place. At this point, landfilled plastics should be reduced by 30% and single-use plastics phased out completely.

The authors hope the roadmap can support the Government of India and industry associations in

responding to the requirements of the United Nations Global Plastics Treaty, set to come into force in 2024. The roadmap was produced as part of an Australia-India Comprehensive Strategic Partnership involving an international team of Australian and Indian research institutes including CSIRO, the University of New South Wales, the University of Technology Sydney Institute for Sustainable Futures, The Energy and Resources Institute (TERI), the Council of Scientific and Industrial Research-National Environmental Engineering Research Institute (CSIR-NEERI) and Development Alternatives.

Khalsa College of Veterinary and Animal Sciences Signs MoU with CSIR-IHBT for Research

CSIR-IHBT

06th February, 2024

Khalsa College of Veterinary and Animal Sciences (KCVAS), Amritsar has signed a memorandum of Understanding (MoU) with Council of Scientific and Industrial Research-Institute of Himalayan Bioresource Technology (CSIR-IHBT), Palampur, Himachal Pradesh for collaborative research, training and academic activities in the area of veterinary sciences and related areas of



mutual interest. Dr. Sudesh Yadav, Director, CSIR-IHBT and Dr. Harish Verma, Principal, KCVAS signed the document to collaborate in the activities related to veterinary sciences. From KCVAS, Dr. SK Nagpal, MD, Dr. PN Dwivedi Head, Microbiology was present & from CSIR-IHBT, Dr Sukhjinder Singh, Coordinator Business Development Unit; Dr Narendra Tirpude, Sr. Scientist; Administrative Officer; and Controller of Finance & Accounts were also present.

Dr Verma revealed that it is an excellent opportunity to expose our veterinary students to the Central Government reputed institute working on utilization of Himalayan bioresource for the benefit of society. This collaborative MoU will provide the Vets to utilize the alternative indigenous medicines for the prevention & treatment of common disease thus curtailing the side effects of allopathic medicines, antimicrobial resistance & also the residue effects in the livestock & poultry produce causing serious problems in the human population. Further, the students & scientists will be exchanged for training & exchange of collaborative research work. Dr Verma thanked the CSIR-IHBT Director Dr. Yadav & his team for this MoU & promised to make it a viable & vibrant MoU for the cause of the society and animals.

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