GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY
LOK SABHA
UNSTARRED QUESTION No. 579
ANSWERED ON 23-07-2025

BioE3 (Biotechnology for Economy, Environment & Employment) Policy

579. Shri Jashubhai Bhilubhai Rathva:
Dr. Rajesh Mishra:
Shri Damodar Agrawal:
Shri Bibhu Prasad Tarai:
Shri Naba Charan Majhi:

Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) the key objectives and features of the BioE3 Biotechnology Policy and the manner in which this policy is helping India to take a leadership role in biotechnology research and innovation;

(b) the details of experiments conducted on microalgae and blue-green algae like Spirulina and Synechococcus along with their role in space nutrition, oxygen production and waste recycling;

(c) the significance of the Department of Biotechnology - International Centre for Genetic Engineering and Biotechnology recently inaugurated in New Delhi and the manner in which it contributes to the Design-Build-Test-Learn cycle;

(d) the manner in which it contribute to the development of biotechnology products for sectors like food, agriculture, chemicals, pharmaceuticals and energy; and

(e) the outcomes of the use of this fertilizer in Sidhi Lok Sabha Constituency?

ANSWER
MINISTER OF STATE (INDEPENDENT CHARGE) FOR THE MINISTRY OF SCIENCE AND TECHNOLOGY & EARTH SCIENCES
(DR. JITENDERA SINGH)

(a) The Union Cabinet has approved BioE3 (Biotechnology for Economy, Environment & Employment**)** policy in August, 2024 to augment innovation-driven support to R&D and entrepreneurship in 6 thematic sectors and accelerate technology development and commercialization by establishing Biomanufacturing & Bio-AI hubs and Biofoundry. The policy is enabling industrialization of biology to promote sustainable and circular practices to address some of the critical societal issues-such as climate change mitigation, food security and human health. The policy is also building a resilient biomanufacturing ecosystem in our nation to accelerate cutting-edge innovations for developing bio-based products.

(b) Three indigenous robust microalgal species namely, *Chlorella sorokiniana*-I, *Parachlorellakessleri*-I and *Dysmorphococcus globosus*-HI, were experimented on the International Space Station (ISS) to study the impact of microgravity, CO_2 and O_2 levels simultaneously in space and on the Earth (indoor lab). In the second experiment, two cyanobacteria strains i.e., an Indian isolate of Spirulina, and a very fast-growing Synechococcus strain were also experimented for their growth on two different nitrogen sources nitrate and urea in the microgravity conditions provided by the ISS. These microalgae have the potential to function effectively in microgravity environments and grow fast on Earth to produce value-added products of industrial importance, while in space, capturing excess CO_2 from the ISS cabin and making vital nutrients and food supplements to support the astronauts' lives in space. On the other hand, the cyanobacteria experiment is expected to demonstrate the ability of cyanobacteria to recycle both C and N and will be an important progress towards developing cyanobacteria-based biological life support systems for futuristic space missions.

(c) The Department of Biotechnology-supported Biofoundry for microbial biomanufacturing will serve as a hub for interdisciplinary collaborations, research, and development in the fields of microbial synthetic biology, metabolic engineering, genetic engineering, and biomanufacturing. The ICGEB Biofoundry will catalyse scientific breakthroughs, drive economic growth, and address key healthcare, agriculture, and environmental sustainability challenges by providing access to cutting-edge technology, expertise, and resources for microbial biomanufacturing. Biofoundry will operate on the principle of Design, Build, Test and Learn (DBTL) model. The Design component of Biofoundry includes the use of AI, big data, computational biology, and bioinformatics, as well as specific domain knowledge for the DNA sequence, pathway analysis, host selection, and experimental design. The Build component of the Biofoundry includes DNA assembly, combinatorial assembly, and organism transformation. This would be followed by the Test component, which would include screening of the transformants, analysis of the products and optimization of the pathways. Finally, the Learn component of Biofoundry would analyse the outcomes of the experiment and use machine learning for further optimization of the pathway.

(d) The Biofoundry established at ICGEB, New Delhi, will be able to handle bacteria and yeast as microbial platforms and produce products used in food, agriculture, chemicals, drugs and energy sectors. It has a production capacity of up to 20 L scale to achieve higher Technology Readiness Level (TRL) and for convenient transfer of technology to the industries. It will facilitate innovation, promote startups, foster entrepreneurship, advance education and training and foster collaborations

(e) This part of the question does not corelate with the part (a) to (d) above.

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