Scholar Publishing Group
Academic Journal of Environmental Biology
https://doi.org/10.38007/AJEB.2022.030205
ISSN 2789-8407 Vol. 3, Issue 2: 58-68

Ecological Environment and Pollution Control under the Influence of Modern Biotechnology Development

Mayak Biseen*

Indira Gandhi Delhi Technical University for Women, India

**corresponding author*

Keywords: Modern Biotechnology, Ecological Environment, Pollution Control, Ecological Value

Abstract: Modern biotechnology (BT) has EV. On the one hand, by giving full play to the role of technology, the relationship between man and nature can be better handled and the two can coexist harmoniously; on the other hand, if problems have arisen in the ecological environment, it is necessary to use existing technologies to prevent ecological imbalances phenomenon to repair, thereby making sustainable development possible. The main purpose of this paper is to analyze and study the impact of the development of modern BT on the ecological environment and pollution control. This paper will focus on the EV of modern BT from three aspects: ecological manufacturing, EG and environmental restoration. In this paper, the screened biological indicators (Neu%, Eos%, Eos#, Lym%, IL-6, IL-10 and CSF) were calculated by comprehensive index. The experimental results found that no matter the average, maximum or minimum values, there were the comprehensive index of biological samples in the high pollution exposure group > the comprehensive index of biological samples in the low pollution exposure group > the comprehensive index of biological samples in the no pollution exposure group.

1. Introduction

Since the 21st century, BT has entered a new era of rapid development. In the process of benefiting the people, technology has also had a certain impact on natural and environmental resources, and even caused a series of global ecological problems. Ecological informatization is imminent. Therefore, my country has put forward a strong demand for the research on the EV of modern BT. By discussing the EV of technology, the EV of modern BT and its application in the ecological environment are proposed, and the application of modern BT in the environment exists. The reasons for the problems and deficiencies are studied, and the solutions and realization methods are studied, so as to give full play to the EV of modern BT [1-2].

Copyright: © 2022 by the authors. This is an Open Access article distributed under the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (https://creativecommons.org/licenses/by/4.0/).

Ali et al mentioned that cellulase, hemicellulose and lignin degrading enzymes are highly efficient biocatalysts that can efficiently convert lignocellulosic biomass into sugars that can be further processed into biofuels, biochemical and Biomaterials [3]. The utilization and transformation of cellulosic biomass are of great significance for solving problems such as environmental pollution and energy crisis. Bajerski et al assessed the potential for microbial contamination of liquid nitrogen (LN) in storage tanks containing different biological materials based on assays based on culture and molecular methods [4]. The sample itself, LN, the human microbiome, and the surrounding environment are possible contamination pathways and may cause cross-contamination through the LN stage.

This paper mainly analyzes the impact of the development of modern BT on the ecological environment and pollution control. The EV of modern BT is reflected in three aspects: ecological manufacturing, EG and environmental restoration. This paper uses the comprehensive evaluation method to calculate the comprehensive index of the selected biological indicators, which corresponds to the environmental pollution level calculated by the concentration of environmental pollutants, and establishes an indoor environmental air pollution evaluation method based on the detection of biological samples. Provide basic research data and theoretical support for the formulation of indoor ambient air quality standards and population health protection measures in my country.

2. Design Research

2.1. The Environmental Governance (EG) Value of Modern BT

EG is the core content of the construction of ecological civilization. Unswervingly implement the "two-type" policy of resource-saving and environment-friendly. Environmental pollution is becoming more and more serious, and human's awareness of environmental protection is improved. EG needs in modern society It has increased to an unprecedented level, and the continuous combination of modern BT and the environment has played a very important role in my country's EG and protection work, and has gradually developed into an important service and support method that my country's ecological field relies on. On the basis of existing EG and protection measures, a new type of environmental information technology is formed, which lays a foundation for EG and protection, and shows irreplaceable EV [5-6].

The fundamental tasks of current national construction include EG and protection. Under the circumstance that the existing implementation plans have not achieved high results, it is necessary to actively explore new environmental protection measures with low cost, high efficiency, low emission and sustainable. Advanced experience at home and abroad shows that the effective way to manage the environment is to use modern BT on a large scale, and it has shown unexpected results. The state should formulate effective supporting policies, increase investment in resources, and establish and improve a nationwide environmental information governance system of “monitoring, control, management, and reform”. The first is to build an environmental monitoring system and use scientific and technological means to improve the understanding of environmental monitoring. Water conservancy, ocean, meteorology, statistics and other service industries should promote the establishment of an environmental monitoring system, realize automatic monitoring, data collection, early warning and other services of multiple pollution sources, and receive new data in a timely and accurate manner. The second is to speed up the construction of enterprise informatization, strictly manage the energy of enterprises, and create a green industry sector. The National Development and Reform Commission, the Ministry of Industry and Information Technology and other institutions

should mobilize social forces to increase research and development efforts, promote information-based products, and encourage enterprises to improve the level of information technology and reduce energy consumption. The third is to establish a unified information base to realize the control loop of environmental pollution control and restoration. It is necessary to strengthen information integration and integration capabilities, establish a unified information database, conduct comprehensive analysis on a large amount of collected data, establish an information exchange mechanism of "one data, one source, and one source for multiple purposes", and monitor the evolution and changes of pollution in real time. The resulting corrections are sent to the competent authorities to ensure appropriate corrections are made to each source of contamination. The fourth is to use modern information technology to strengthen public education and publicity to improve the public's understanding of local governance. Governments at all levels should strengthen publicity and education on green environmental protection, energy conservation and emission reduction according to the actual situation and through various media platforms, such as setting up environmental protection classes in schools, so that students who have learned can understand the protection of the physical environment [7-8].

Modern BT shows its ecological governance value through the process of environmental monitoring, pollution control, environmental rectification and environmental awareness enhancement. Nevertheless, in today's information age, if we want to give full play to the advantages and EV of modern BT, we must Establish a more complete environmental management mechanism and strengthen the application of BT in EG and protection, thereby accelerating the process of my country's ecological environment informatization [9-10].

2.2. Characteristics of Ecological Restoration (ER)

ER has obvious characteristics, mainly including the following aspects:

First, strictly follow ecological principles such as recycling. First, cycle regeneration. After the synthesis of matter is complete, it needs to be broken down to form simpler, non-biological types of matter. In this way, the metabolic function of the environment can be enhanced, increasing the ability of the system to regenerate itself. Second, harmonious coexistence. In order to achieve cyclic regeneration, it is necessary to construct a community containing multiple plants, animals and microorganisms, and because of their complex interactions, it is necessary to ensure that they coexist harmoniously. For example, phytoremediation can be achieved by increasing the microbial community, increasing the ability to decompose pollutants, and converting them into components that are beneficial to plant growth. Third, overall optimization. The ecosystem is regarded as an inseparable whole. While controlling the pollution source, it is necessary to strengthen the local barrier of pollutants, and at the same time take effective pollutant pretreatment measures; achieve the effect of overall governance. Finally, regional division. In order to effectively control the transfer of pollutants, even in the same treatment area, it is necessary to do a good job in the investigation of hydrology, soil and microbial populations in different intervals, to divide the area, and to take corresponding and differentiated treatment measures [11-12].

Second, the influencing factors are many and complex. To achieve a good ER effect, it is necessary to ensure that the selected plants and microorganisms can decompose the pollutants well and form a good cycle. However, the factors affecting microbial activities are very diverse, which increases the complexity of ER accordingly.

Third, interdisciplinary. To ensure that the corresponding goals are achieved, it is necessary to comprehensively use the knowledge of microbiology, physics, ecology, environmental engineering

and other disciplines, so it must have the characteristics of interdisciplinary.

It is precisely because of these characteristics of ER that the continuous integration of technology with it reflects unprecedented EV [13-14].

2.3. Reasons for the Insufficient Development of the Ecological Value (EV) of Modern BT

(1) Weak public ecological awareness

In recent years, my country has used modern BT to develop ecological manufacturing, green manufacturing, and intelligent manufacturing, which means promoting green economy, clean production, and sustainable development. However, under the temptation of economic interests, many companies still ignore environmental protection. and resource conservation, while consuming a large amount of energy, it also has a great impact on the environment, and my country is precisely in the management of high pollution and high energy consumption. Although the continuous development of modern BT has continuously changed my country's industrial structure and However, the phenomenon of high pollution and high energy consumption in the manufacturing industry is still very serious.

The emergence of modern BT has made enterprises and the public more aware of the economic value it produces, while ignoring the EV of modern BT, thereby causing great pollution to the environment while improving production efficiency and economic benefits, hindering modern BT The realization of EV of technology. Therefore, even in cities with high economic level, the public's awareness of the pollution caused by BT is not strong enough, and the awareness of ecological environmental protection is still relatively weak [15-16].

(2) Lack of technological innovation and professional talents

With the development of BT in my country, the most important problem we are facing is the lack of independent renewable energy. Compared with developed countries, there is still a big gap. It is reflected in: basic BT and software are still imported; renewable resources The integration has not been smooth sailing, resulting in different degrees of disconnection in the technological innovation chain; the global competition of emerging technologies and enterprises has not been strictly controlled; the core BT reserves are insufficient, and the application of modern BT in the ecological field also has the phenomenon of lack of technological innovation.

(3) Insufficient capital investment and imperfect security system

Capital investment is the material guarantee for the smooth progress of ecological informatization, and sufficient expenses are to ensure the research and development, innovation and application of various modern biotechnologies in various fields. At the same time, affected by factors such as low return on investment and high corporate risks, it is difficult for companies in these fields to obtain financing through the financial market. For example, in the construction of a smart city, many fields need to be involved. The initial infrastructure construction requires huge investment of manpower, material resources and financial resources. However, an important factor that restricts the development of smart cities in my country is the lack of capital investment, especially in the central and western regions. Regional investment is limited, local governments lack overall planning, and funds are not concentrated, resulting in slow development and construction of "smart, green, and safe" smart cities, and poor EG and protection. It can be seen that sufficient capital investment is an indispensable material guarantee for the development of modern BT, and it is also the basis for the construction of ecological civilization [17-18].

3. Experimental Study

3.1. Technology and ER

According to the ER Association, "ER" is mainly a conscious activity that, due to its role, makes the restoration and sustainable development of ecosystems possible. The events of ER include: soil erosion control, reforestation, use of native species to remove non-native species and weeds, restoration of original ecology, lighting, re-introduction of native species, and improvement of the habitat and range of target species. If modern technology can be used reasonably, more and more social wealth can be created for people, thereby transforming the quality of life of each individual. In modern social practice, due to the gradual increase in the degree of abuse of technology, the damage to the environment has gradually reached a new height, and in some fields it has even broken the limit of the environment. To this end, it is necessary to use technology to improve the environment, otherwise the sustainable development of human beings will face a huge threat. Through continuous research and trial of environmental protection technologies, the rationality of people's production practices can be further improved, thereby promoting the harmony between human beings and nature. For this, the following measures need to be taken:

First of all, it is necessary to further increase the research and development funds of related technologies, and organize technical personnel to make breakthroughs in key environmental protection technologies; at the same time, encourage emerging environmental protection industries to provide policy support for the new technologies and new environmental protection equipment they use; in addition, encourage more The technical personnel enter the field of environmental protection technology research and development, and provide them with sufficient funds, equipment and platforms.

Secondly, strengthen the improvement and promotion of environmental protection monitoring technology, supervise micro-enterprises and other entities that may cause environmental damage, and allow more and more energy-saving technologies to be used in the production process, gradually reduce waste emissions, and within an appropriate range, better deal with pollution.

Furthermore, an atmosphere of using green products is formed in the whole society, and through the role of consumption orientation, enterprises are guided to upgrade environmental protection technology and improve the operation process, so as to achieve cleaner production to a greater extent.

Finally, encourage scientific research institutions to carry out active environmental protection technology research and development, and establish a corresponding achievement transformation system from then on, and continue to improve it to reduce institutional obstacles.

It is not difficult to see that technology not only plays an important role in ecological manufacturing and EG, but also plays an irreplaceable role in ER.

3.2. Establishment of Indoor Ambient Air Pollution Assessment Methods

(1) Selection of evaluation methods

There are many evaluation methods currently used to evaluate indoor ambient air quality. Among them, the unified evaluation method is based on one index, through appropriate comparison, to make judgments from specific aspects, and the evaluation results cannot show the synergy between different indicators. Although the fuzzy comprehensive evaluation method, the grey system method and the artificial neural network method comprehensively consider the influence of multiple indicators, the calculation methods are complicated and involve many disciplines. The

comprehensive index method can comprehensively judge and fully judge related phenomena from multiple different points based on multiple indexes. It has the advantages of simplicity and convenience, and has no special requirements for sample data. Therefore, in this study, the comprehensive index method was selected for the assessment of indoor ambient air pollution based on biological samples.

(2) Establishment of evaluation model

In this study, it is necessary to obtain the exposure environmental pollution level according to the concentration of environmental pollutants and then correspond to the comprehensive index of biological samples to obtain an indoor environmental air pollution assessment method based on biological sample detection. The specific steps are shown in Figure 1.

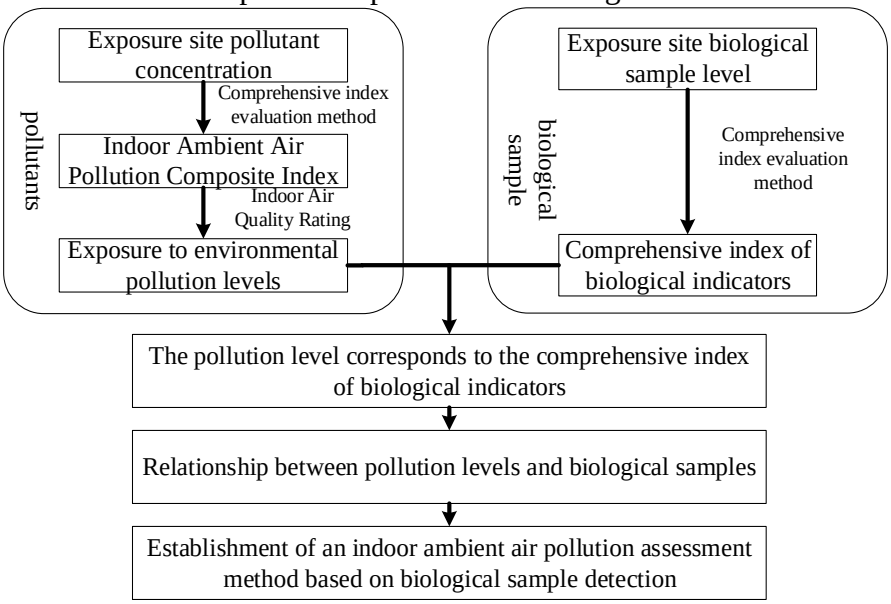

Figure 1. Establishment of an assessment method for indoor ambient air pollution

(3) Calculation steps of comprehensive index method

The overall index method is a deterministic evaluation method, which is based on a reasonable index system, and performs simple sorting, weighted average, maximum and other calculations on each index of each index. In this study, the comprehensive index of environmental quality was calculated by the maximum value method. The specific steps are as follows:

1) Divide the actual value of each index by the standard maximum value of each index to obtain the evaluation index of each index.

$$P_i = C_i / S_i \tag{1}$$

In the formula, Pi is the single index of the ith index, Ci is the actual value of the ith index, and Si is the standard upper limit of the ith index.

2) Use the maximum value method to calculate the comprehensive index of environmental quality.

$$P_{comprehensive} = \sqrt{\frac{(\frac{C_i}{S_i})^2_{\max} + (\frac{C_i}{S_i})^2_{ave}}{2}} \tag{2}$$

In the formula, (Ci/Si)max is the maximum value of the index in each index, and (Ci/Si)ave is the average value of the single index.

3) Comparing the comprehensive index with the evaluation rules to obtain the corresponding indoor ambient air pollution level.

3.3. Calculation of the Comprehensive Index of Biological Samples

The biological indicators involved in the evaluation are the indicators affected by indoor ambient air pollution screened out through the previous analysis of variance, linear regression analysis and correlation analysis, namely: Neu%, Eos%, Eos#, Lym%, IL-6, IL-10 and CSF, a total of 7 kinds. Using the comprehensive index method to calculate the comprehensive index of biological samples, the specific calculation steps are as follows:

(1) Grouping of experimental volunteers: The experimental volunteers were divided into three groups. The volunteers wearing non-breathing purification device respirator in the simple room were defined as the high pollution exposure group, and the volunteers wearing non-breathing purification device respirator in the hardcover room were defined as the high pollution exposure group. It was defined as the low pollution exposure group, and the volunteers wearing respirator with respiratory purification device in the simple room and hardcover room were defined as the non-pollution exposure group.

(2) Selection of the reference value of biological indicators: Since the reference limit of biological indicators is often a range, the upper limit of the standard cannot be directly used as the reference limit like the level of environmental pollutants. And there are differences in the range of normal values corresponding to different detection methods of the same biological indicator, and the ELISA method used in this experiment needs to establish normal values according to the respective established laboratory methods. Therefore, in order to facilitate comparison, this study took the average level of each biological indicator before the exposure experiment as the reference limit, and calculated the comprehensive index method.

(3) Bring the corresponding biological index levels of each volunteer into formulas (1) and (2) to obtain the comprehensive index of biological indicators, and analyze and compare according to groups.

4. Experiment Analysis

4.1. Calculation of Indoor Ambient Air Pollution Level

(1) Classification of indoor ambient air pollution levels

In this study, the general classification benchmark in my country is used to divide the indoor ambient air pollution into 5 grades, and the comprehensive environmental quality index corresponding to each grade is shown in Table 1.

(2) Calculation of indoor pollution levels in two exposure environments

The average concentration of each pollutant in the two exposure environments is put into formulas (1) and (2) respectively, and the comprehensive index of environmental quality is calculated. The calculation results are shown in Table 2. The calculation results show that the indoor air pollution level of the simple decoration room is Ⅴ, and the grade comment is heavy pollution; the indoor environmental air pollution level of the hardcover room is Ⅲ, and the level comment is light pollution.

Table 1. Indoor ambient air pollution classification standards

Composite index range	Indoor air quality rating	Rating comments
⩽0.49	Ⅰ	Clean
0.50~0.99	Ⅱ	Uncontaminated
1.00~1.49	Ⅲ	Light pollution
1.50~1.99	Ⅳ	Medium pollution
⩾2.00	Ⅴ	Heavy pollution

Table 2. Evaluation index of various pollutants

	Standard value (mg/m3)	Evaluation index	
		Simple room	Hardcover room
Formaldehyde	0.10	0.80	1.33
TVOC	0.60	2.90	0.93
Benzene	0.11	0.54	0.3
Toluene	0.20	3.55	0.70
Xylene	0.20	0.52	0.33
Comprehensive index of environmental quality	-	2.77	1.06
Pollution level	-	Heavy pollution	Light pollution

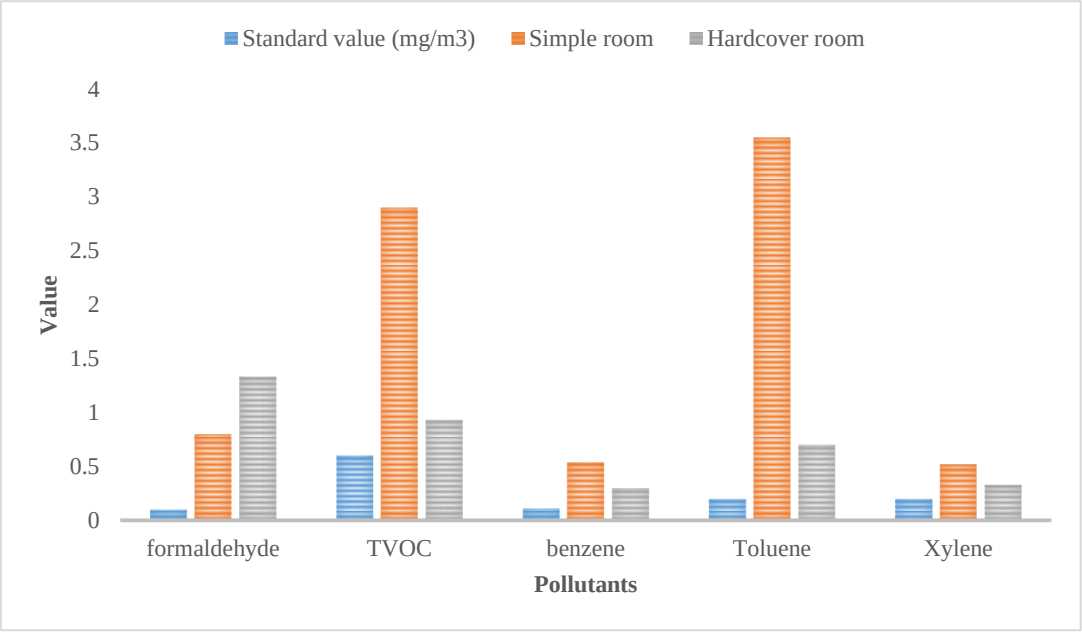

Figure 2. Evaluation index analysis of various pollutants

4.2. Comparison of Comprehensive Index of Biological Indicators

Through the calculation of the levels of various biological indicators, the comprehensive index of biological indicators was obtained, and the analysis and comparison were carried out according

to the groups. The calculation results are shown in Table 3.

Table 3. Composite index of biometrics

Composite index	High pollution exposure group	Low pollution exposure group	No pollution exposure group
Average value	1.72	1.46	1.38
Standard deviation	0.39	0.07	0.07
Minimum	1.37	1.36	1.31
Maximum value	2.22	1.53	1.53

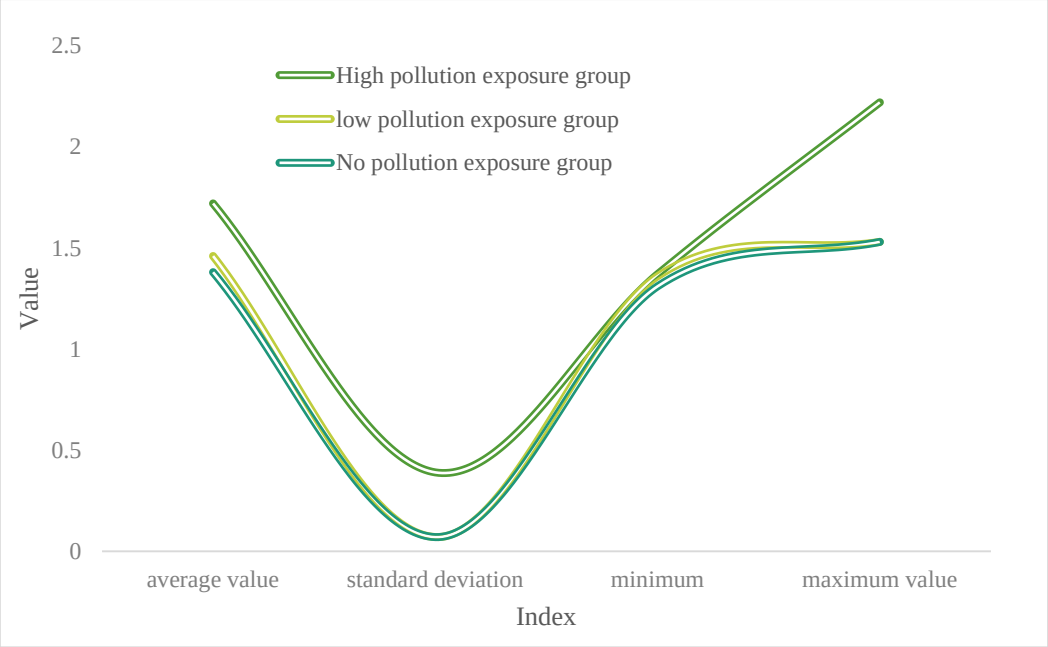

Figure 3. Analysis of the comprehensive index of biological indicators

It can be found from Figure 3 that, regardless of the mean value, maximum value or minimum value, the comprehensive index of biological samples in the high pollution exposure group > the comprehensive index of biological samples in the low pollution exposure group > the comprehensive index of biological samples in the non-pollution exposure group.

5. Conclusion

In addition to its economic, political and cultural value, modern BT also has EV, but few scholars have clearly pointed out the issue of "technological EV", and a considerable number of people only pay attention to what the development and use of technology will bring to the ecology. Destruction is not conducive to the sustainable development of the ecological environment. Relatively speaking, through the use of technology, people respect the laws of nature, transform nature, coordinate the contradiction between man and nature, and maintain the balance of the ecosystem in social and economic activities. It can not only promote resource protection and Environmentally friendly and can also promote sustainable development. It is worth noting that technology, as a means of changing nature, is actually a definition of technology from the perspective of the relationship

between man and nature. The economic, political, cultural and EVs of modern BT are not isolated, but interconnected and complement each other. However, the EV of modern BT is the highest value of technology and cannot be ignored.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Asa B, Ssa B, Sba B, et al. Synthetic biology techniques to tackle heavy metal pollution and poisoning. Synthetic and Systems BT, 2022, 7(3):841-846. https://doi.org/10.1016/j.synbio.2022.04.007

[2] Choi Y, Han S W, Kim J S, et al. Biochemical characterization and synthetic application of aromatic l-amino acid decarboxylase from Bacillus atrophaeus. Applied Microbiology and BT, 2021, 105(7):2775-2785. https://doi.org/10.1007/s00253-021-11122-3

[3] Ali N, Zhang Q, Liu Z Y, et al. Emerging technologies for the pretreatment of lignocellulosic materials for bio-based products. Applied Microbiology and BT, 2020, 104(2):455-473.

[4] Bajerski F, Nagel M, Overmann J . Microbial occurrence in liquid nitrogen storage tanks: a challenge for cryobanking?. Applied Microbiology and BT, 2021, 105(20):7635-7650.

[5] Lee M S, Hung C S, Phillips D A, et al. Silk Fibroin as an Additive for Cell-Free Protein Synthesis. Synthetic and Systems BT, 2020, 5(3):145-154.

[6] Junaid K, Ejaz H, Younas S, et al. Detection of Klebsiella pneumoniae antibiotic-resistant genes: An impending source of multidrug resistance dissemination through raw food. Saudi Journal of Biological Sciences, 2022, 29(5):3347-3353. https://doi.org/10.1016/j.sjbs.2022.02.020

[7] Bae J, Song Y . Engineering a cell-penetrating hyperstable antibody scFv(Ras) – An extraordinary approach to cancer therapeutics. Synthetic and Systems BT, 2021, 6(4):343-350.

[8] Altamirano F, Barr J J . Unlocking the next generation of phage therapy: the key is in the receptors. Current Opinion in BT, 2021, 2021(68):115-123.

[9] Lrb A, Eb B, Kh B, et al. The Fold-Illuminator: A low-cost, portable, and disposable incubator-illuminator device. Synthetic and Systems BT, 2021, 6(2):95-101. https://doi.org/10.1016/j.synbio.2021.04.003

[10] Naz H, Akram N A, Ashraf M, et al. Leaf extract of neem (Azadirachta indica) alleviates adverse effects of drought in quinoa (Chenopodium quinoa Willd.) plants through alterations in biochemical attributes and antioxidants. Saudi Journal of Biological Sciences, 2022, 29(3):1367-1374. https://doi.org/10.1016/j.sjbs.2022.01.038

[11] Atmc A, Lps B, Joc C, et al. Shape and size of epididymal sperm from Gir bulls using atomic force microscopy: A nanoscale characterization of epididymal sperm - ScienceDirect.

Reproductive Biology, 2020, 20(1):37-41.

[12] Moriyama Y, Takeda K . Removal of Dodecyl Sulfate Ions Bound to Human and Bovine Serum Albumins Using Sodium Cholate. Journal of Oleo Science, 2020, 69(1):65-72. https://doi.org/10.5650/jos.ess19224

[13] Mehta A, Grover C, Bhardwaj K K, et al. Application of Lipase Purified from Aspergillus fumigatus in the Syntheses of Ethyl Acetate and Ethyl Lactate. Journal of Oleo Science, 2020, 69(1):23-29. https://doi.org/10.5650/jos.ess19202

[14] Subramaniyan S B, Senthilnathan R, Arunachalam J, et al. Revealing the Significance of the Glycan Binding Property of Butea monosperma Seed Lectin for Enhancing the Antibiofilm Activity of Silver Nanoparticles against Uropathogenic Escherichia coli. Bioconjugate Chemistry, 2020, 31(1):139-148.

[15] Gupta N J, Nanda R K, Das S, et al. Night Migratory Songbirds Exhibit Metabolic Ability to Support High Aerobic Capacity during Migration. ACS Omega, 2020, 5(43):28088-28095. https://doi.org/10.1021/acsomega.0c03691

[16] Dvorak M, Rysava L, Kuban P . Capillary Electrophoresis with Capacitively Coupled Contactless Conductivity Detection for Quantitative Analysis of Dried Blood Spots with Unknown Blood Volume. Analytical Chemistry, 2020, 92(1):1557-1564.

[17] Musliji Z S, Pollozhani A K, Lisichkov K, et al. Comparative analysis of genes associated with obesity in humans using bioinformatic data and tools. Balkan Journal of Medical Genetics, 2021, 24(1):35-40. https://doi.org/10.2478/bjmg-2021-0012

[18] Thomsen T, Borre-Gude S . Creating a Strong Safety Culture in an Undergraduate Engineering Program. Journal of Chemical Education, 2021, 98(1):118-124. https://doi.org/10.1021/acs.jchemed.0c00035