TPM Vol. 32, No. S6, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

THE ROLE OF MARINE COMPOUNDS IN CANCER TREATMENT

SHUKHRAT BOYMURADOV[1]
[2]TASHKENT MEDICAL ACADEMY, UZBEKISTAN,
EMAIL: sh.boymuradov@tma.uz, ORCID ID: https://orcid.org/0000-0002-2379-1592

MOHAMMED H.F[2]
[2] DEPARTMENT OF COMPUTERS TECHNIQUES ENGINEERING, COLLEGE OF TECHNICAL ENGINEERING, ISLAMIC UNIVERSITY IN NAJAF, NAJAF, IRAQ
[2]DEPARTMENT OF COMPUTERS TECHNIQUES ENGINEERING, COLLEGE OF TECHNICAL ENGINEERING, ISLAMIC UNIVERSITY IN NAJAF OF AL DIWANIYAH, AL DIWANIYAH, IRAQ
EMAIL: iu.tech.eng.mhussien074@gmail.com

NAJMITDINOV AKHADKHON KHAMITDKHANOVICH[3]
[3]FACULTY OF BUSINESS ADMINSTRATION, TURAN INTERNATIONAL UNIVERSITY, NAMANGAN,
EMAIL: Uzbekistan.a.najmitdinov@turan-edu.kz ORCID DI: https://orcid.org/0009-0005-9740-1971

K.R. CHIDAMBARAM[4]
[4]DEPARTMENT OF MARINE ENGINEERING, AMET UNIVERSITY, KANATHUR, TAMILNADU -603112,
chidambaram.kr@ametuniv.ac.in, 0009-0000-5311-1394

DR. D KALIDOSS[5]
[5]ASSOCIATE PROFESSOR, KALINGA UNIVERSITY, RAIPUR, INDIA.
EMAIL: dr.kalidoss@kalingauniversity.ac.in ORCID:0000-0001-8286-9516

Abstract
Potential phytocompounds for the creation of novel drugs can be found in natural goods. Plants are the source of around 30% of the most popular medications on the market. It is necessary to search for alternative sources of anticancer medications in light of these results. Phytocompounds found in plants are crucial to the development of novel medications. In addition to stimulating the immune system, phytocompounds also detoxify food chemicals from turning into carcinogens, reduce inflammation, protect cells from oxidative stress, initiate programmed cell death, and inhibit the carcinogenesis mechanism. Less study has been done on the medicinal potential of the red algae G.acerosa, but it has not yet been possible to isolate its bioactive ingredients and identify its anticancer properties. As a result, the current study depends on the chemicals from G.acerosa being isolated, characterized, and their cancer-causing potential evaluated. Using the extract and isolated components of G.acerosa, the current study also sought to investigate the genes and pathways involved in the control of lung cancer.
Keywords: cancer, Drugs, marine, Algae.

1. INTRODUCTION

A medical condition known as cancer is brought on by unchecked, aberrant cell proliferation in a body part. A collection of disorders called cancer, sometimes referred to as malignant tumors or malignant neoplasms, are brought on by aberrant cell growth that has the potential to infiltrate or spread to other parts of the body. Benign tumors do not spread to other parts of the body, hence not all tumors are cancer. A new lump, unusual bleeding, a persistent cough, unexplained weight loss, and altered bowel habits are just a few of the numerous possible indications and symptoms of cancer. The symptoms listed above can be caused by cancer, but they can also be the result of other illnesses. There are more than 100 recognized human cancers [1]. About 22% of cancer fatalities are caused by tobacco use, but 10% are caused by obesity, alcohol usage, physical inactivity, and malnutrition [16]. Ionizing radiation exposure, some diseases, and environmental contaminants are the remaining reasons [10]. Nearly 20% of cancer cases in the third world are caused by infections like hepatitis B, hepatitis C, and the human papillomavirus, which at least partially work by changing the way genes are expressed and their structure [17]. For cancer to occur, multiple such genetic changes may be necessary. About 5–10% of cancers are caused by genetic defects a person inherits from their parents. Screening tests or specific indications and symptoms can be used to identify cancer. Usually, a biopsy is used to make the diagnosis after additional imaging research [2]. The majority of cancers can be avoided by abstaining from smoking, maintaining a healthy weight, limiting alcohol intake, eating a lot of fruits, vegetables, and whole grains, getting vaccinated against some infectious diseases, limiting red meat consumption, and limiting sun exposure [3]. Cancers of the cervical and colorectal regions can

be prevented and treated with early diagnosis of malignancy [14]. There is debate on the advantages of breast cancer screening. Radiation therapy, surgery, chemotherapy, and targeted therapy are all used to treat cancer. Although there are several approaches to cancer treatment, the primary three are radiation therapy, chemotherapy, and surgery [18]. More recently, targeted therapy, hormone therapy, and tailored therapy have also been employed. In general, the type of treatment that should be used depends on the patient's health situation as well as the type, location, and stage of the cancer. Chemotherapy is a type of cancer treatment that involves a regular schedule of one or more antineoplastic medications, sometimes known as chemotherapeutic medicines. The word "chemotheraphy" has been used to refer to any of a wide range of distinct anticancer medications grouped into two general categories: alkylating medicines and antimetabolites. Cells doubling at the cell cycle rate of growth and even the initial inherent property of many malignant cells are destroyed by the conventional chemotherapeutic drugs. Additionally, it fulfills the nearby normal fast-growing body cells while killing the malignant cell. Chemotherapy's primary issue is toxicity, which results in unwanted side effects [11]. Targeted therapy stops the growth of cancer cells by blocking certain chemicals that cause carcinogenesis and tumor development. Drugs or other substances that block particular molecules essential to the survival and proliferation of cancer cells are known as targeted treatments [4]. However, all cells that are actively developing are impacted by traditional chemotherapy medicines. Since "chemotherapy" officially only refers to "treatment with chemicals," targeted agents can also be referred to as "chemotherapy" or "non-cytotoxic chemotherapy". However, "chemotherapy" is now used specifically for "traditional" cytotoxic chemotherapy in both traditional medical and everyday usage. Numerous target-specific medicines, including hormone therapies, signal transduction inhibitors, gene expression modifiers, apoptosis inducers, angiogenesis inhibitors, immunotherapies, and toxin delivery agents, have been approved for use in the treatment of cancer.

2. REVIEW OF LITERATURE

From microalgae to macroalgae, marine algae are eukaryotic, photosynthetic plants. The unicellular phytoplanktons known as microalgae are the main food providers in the ocean [5]. They include the 40,000–70,000 species of blue-green algae, dinoflagellates, and diatoms that live in the ocean's littoral and benthic regions. Red, green, and brown algae are the three types of multicellular seaweeds, sometimes known as marine macroalgae. The sea's littoral zones are home to macroalgae. Since 600 BC, China and other Asian countries have included the majority of edible marine algae in their traditional diets [12]. The introduction of kainic acid as an anthelmintic and insecticide in 1900 marked the beginning of the history of MNPs in the pharmaceutical industry [6]. Spongothymidine and spongouridine followed in 1950. The Food and Drug Administration (FDA) and the European Union have recently (till 2011) approved eight medications of marine origin to treat a variety of illnesses. These medications include: Iota carrageenan [15], Ziconitide (2004), Omega 3 fatty acid ethyl ester, Eribulin Mesylate (2010), Brentunimab vedotin (2011), Cytrabine (1969), Vidrabine (1976), and Trabectidin (2007). The sea's intertidal and subtidal zones are home to red algae. There are over 10,000 kinds of red algae in the world. They are red because they contain the pigments phycocyanin and phycoerythrin. Red algae are utilized extensively in medicine because they have high quantities of bioactive compounds [19].

3. MATERIALS AND METHODS

In this study, the antioxidant, anticancer, antimetastatic, and anti-inflammatory properties of the red algae Gelidiella acerosa were screened. Gelidiella acerosa (Forsskal) is a member of the Gelidiellaceae family. In coastal areas of South India, the seaweed grows unchecked. It grows by adhering to rocks and is found in the intertidal zone. Around the world, the seaweed is used commercially to produce premium agar [7].

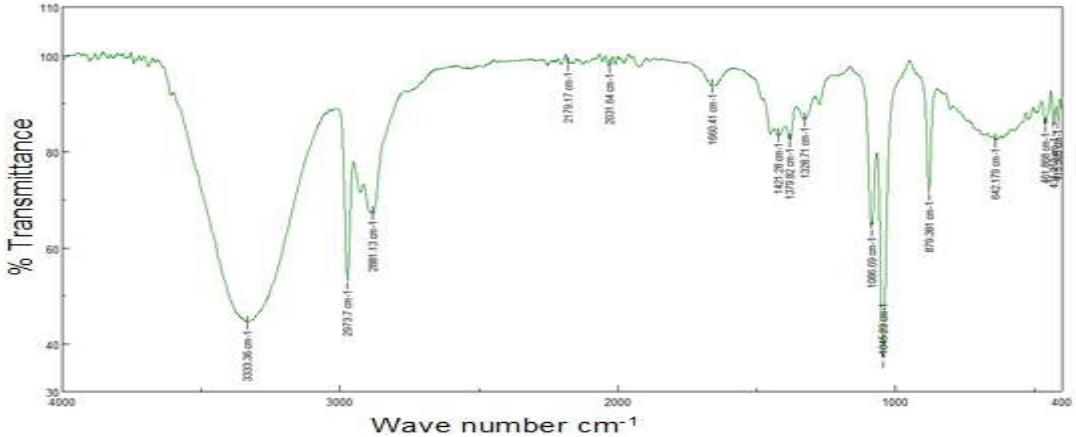


Figure 1: FT-IR analysis of algal extracts

Furthermore, it was discovered that the algae inhibited the activity of the enzyme's butyl and acetyl choline esterase. The algae's silver nanoparticles exhibited antifungal properties. Even while some studies on algae have shown that they have therapeutic properties, research on the active chemicals and how they work in cancer is still in its early stages. Thus, the goal of the current study was to isolate and characterize G.acerosa's bio actives and their anti-inflammatory, anti-cancer, anti-metastatic, and antioxidant properties. Although seaweeds have long been used as food and medicine, reports of their therapeutic benefits are extremely uncommon [8]. The absence of sophisticated techniques required for their separation and characterization could be the cause of this. However, the isolation and characterization of MNPs have been aided by recent developments in analytical techniques, spectrophotometers, and NMR techniques [13]. There have been 28,000 MNPs revealed in the last several decades. Algae were extracted for the current study, and the extracts were examined using FTIR, HPLC, GC-MS, and NMR techniques.

4. RESULT

Antioxidants function by boosting the activity of antioxidant enzymes and eliminating free radicals. A novel natural source of antioxidants that are safe for the animal system is sought after, nonetheless, because the synthetic antioxidants (Beta hydroxyl toluene) were hazardous to animals [9]. In light of this and the fact that G.acerosa has been shown to possess antioxidant properties, the current study investigated how well it eliminates free radicals. Additionally, the study assessed how well G.acerosa and its extracts increased SOD and POX activities in vitro.

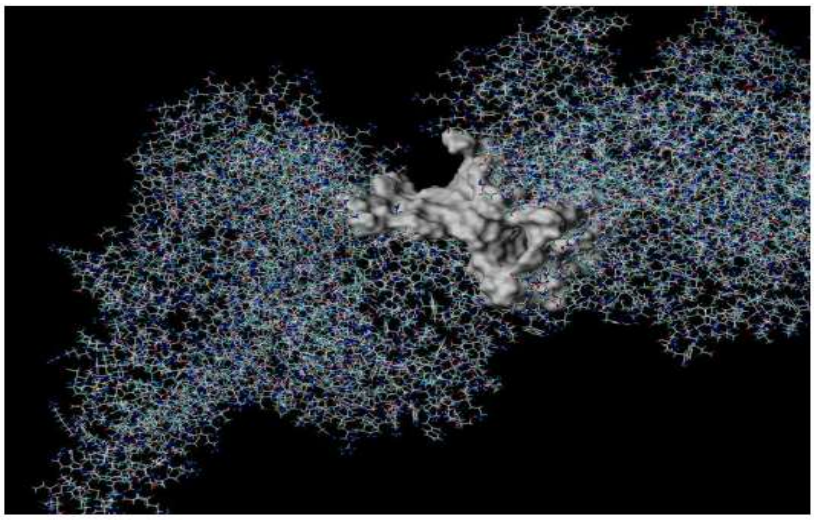
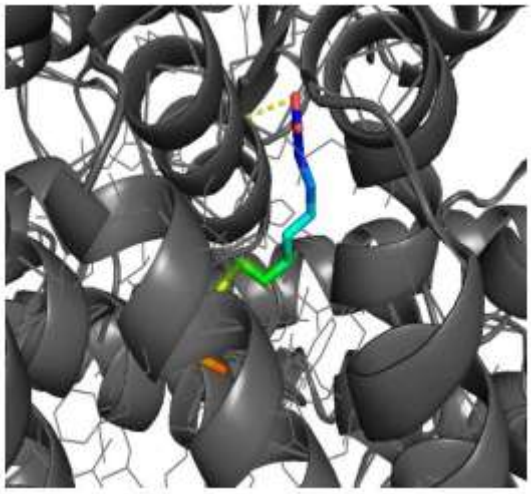
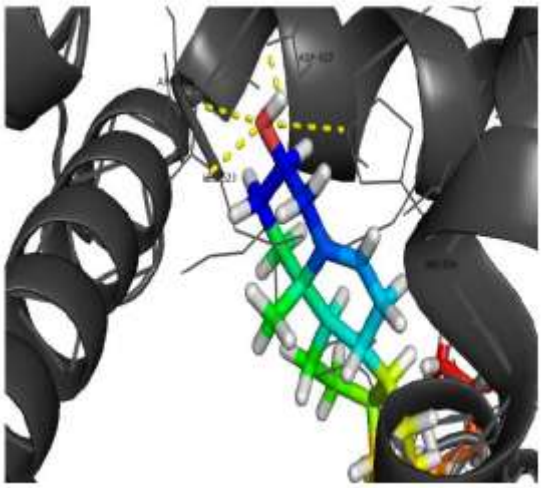


Figure 2: Structure of PI3K showing the active site

Cancer develops when cells acquire various genetic changes and defense systems against programmed cell death, or apoptosis. Unchecked cell development is the result of this breakdown of homeostasis. Apoptosis evasion and the ability of cancer cells to spread to new locations, known as metastasis, present the largest obstacles to cancer treatment.



(a)



(b)

Figure 3: Training and Validation Loss

The primary cause of death from cancer is metastasis, or the spread of the tumor. It includes membrane deterioration, tumor cell separation from the original tumor, migration to other locations, and the formation of secondary tumors. MMPs, or matrix metalloproteases, are important components involved in metastasis. Therefore, the goal of the current work is to suppress MMPs in order to prevent cancer metastases. Inflammation is invariably associated with cancer. Stress from the environment causes lung cells to produce ROS. Lung cells are destroyed when ROS are not effectively eliminated.

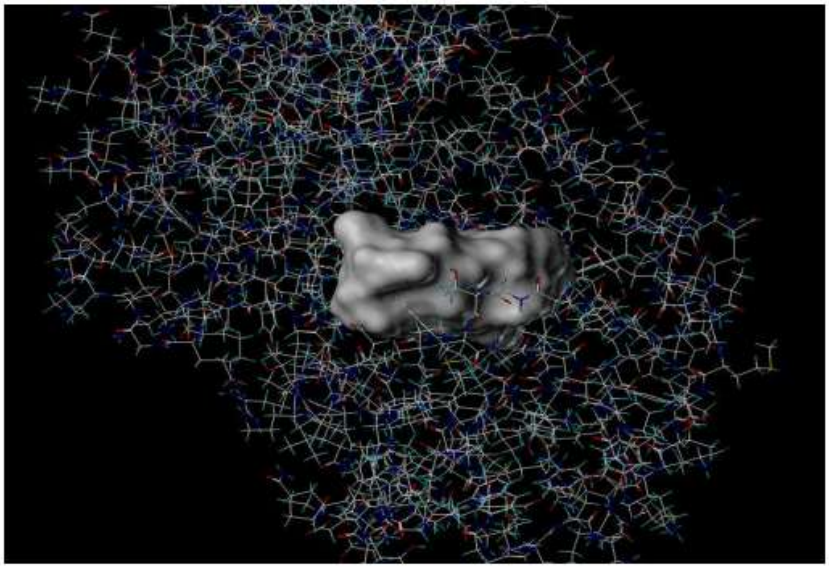


Figure 4: Structure of Akt showing the active site

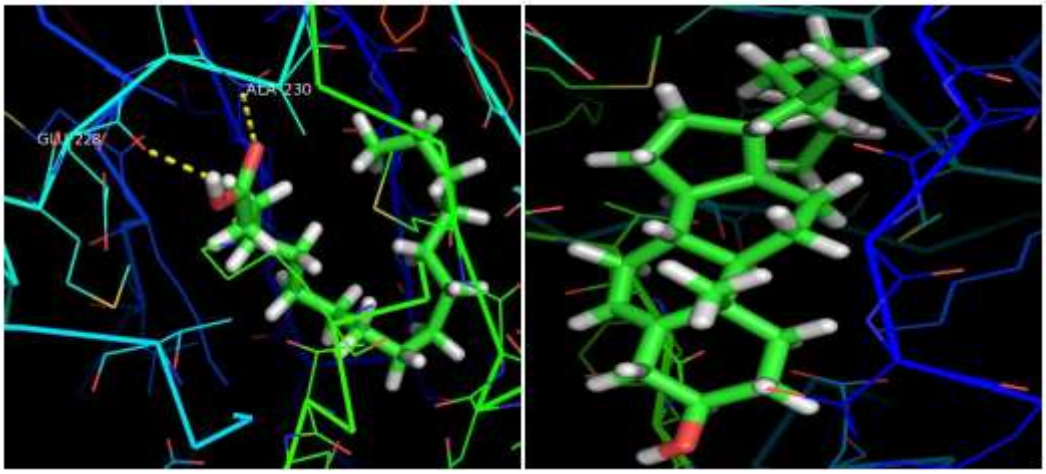


Figure 5: Interaction of GAC 1 with Akt

Previous studies have already demonstrated constitutive NFKB-p65 activation in lung cancer. Furthermore, NFKB signalling is activated by therapeutic medications that are typically used to treat the illness, which might lead to treatment resistance.

5. CONCLUSION

Furthermore, half of the medications currently in use are made from natural sources or contain naturally occurring lead compounds. The pharmaceutical business has turned its attention to the utilization of natural goods due to the toxicity caused by synthetic chemicals during clinical testing. More use of natural ingredients has been put on the table for drug research and discovery in conjunction with improvements in analytical methods. Seventy-five percent of all living things from 36 phyla are found in the sea, which represents a mature ecosystem. The structure and specificity of marine natural products (MNPs) vary completely according to the correlation between taxonomic diversity and chemical diversity. Sea organisms are able to survive in the hostile marine environment because to the MNPs. The MNPs may therefore be promising candidates for the discovery of novel medications and lead compounds. According to this approach, 28,000 MNPs have been isolated as a result of the increased utilization of marine species in recent years. The marine algae are one of the most well-known marine creatures. They are an excellent source of phytocompounds with a wide range of medicinal uses. Their properties include antibacterial, antiviral, antioxidant, antidiabetic, antipyretic, anticancer, antimycobacterial, analgesic, anticoagulant, anti-inflammatory, and antiprotozoan.

REFERENCES

1. Dyshlovoy, Sergey A., and Friedemann Honecker. "Marine compounds and cancer: updates 2022." Marine Drugs 20, no. 12 (2022): 759.
2. Akila, A., Nandhini, S., Pavithra, M., Suman, K., & Madhorubagan, E. (2023). Enhancing Data Storage Security using Block Chain Technique in Cloud Computing. International Journal of Advances in Engineering and Emerging Technology, 14(1), 77–86.
3. Nobili, Stefania, Donatella Lippi, Ewa Witort, Martino Donnini, Letizia Bausi, Enrico Mini, and Sergio Capaccioli. "Natural compounds for cancer treatment and prevention." Pharmacological research 59, no. 6 (2009): 365-378.
4. Sethi, K., & Kapoor, M. (2024). Data-Driven Marketing in the Age of AI: Reflections from the Periodic Series on Technology and Business Integration. In Digital Marketing Innovations (pp. 7-11). Periodic Series in Multidisciplinary Studies.
5. Chandravanshi, N., & Neetish, K. (2023). Diurnal Variations in Greenhouse Gas Emissions from a Macrophyte-Covered River. Aquatic Ecosystems and Environmental Frontiers, 1(1), 11-15.
6. Sengupta, S., & Deshmukh, A. (2024). Blockchain for Transparent Supply Chains: Enhancing Accountability in SDG-Aligned Trade. International Journal of SDG's Prospects and Breakthroughs, 2(1), 7-9.
7. Wei, Jiaen, Ruining Liu, Xiyun Hu, Tingen Liang, Zhiran Zhou, and Zunnan Huang. "MAPK signaling pathway-targeted marine compounds in cancer therapy." Journal of Cancer Research and Clinical Oncology 147 (2021): 3-22.
8. Baggyalakshmi, N., Janani Shree Priya, M., & Revathi, R. (2024). Online Shopping System. International Academic Journal of Science and Engineering, 11(1), 71–80. https://doi.org/10.9756/IAJSE/V11I1/IAJSE1110
9. Dyshlovoy, Sergey A., and Friedemann Honecker. "Marine compounds and cancer: where do we stand?." Marine Drugs 13, no. 9 (2015): 5657-5665.
10. Baggyalakshmi, N., Kavidharshini, M., & Revathi, R. (2023). Departmental Store Management System. International Academic Journal of Innovative Research, 10(2), 18–26. https://doi.org/10.9756/IAJIR/V10I2/IAJIR1006
11. Zuo, Weimin, and Hang Fai Kwok. "Development of marine-derived compounds for cancer therapy." Marine drugs 19, no. 6 (2021): 342.
12. Alkaim, A., & Hassan, A. (2024). Incorporating Training and Management for Institutional Sustainability: The Worldwide Implementation of Sustainable Development Goals. Global Perspectives in Management, 2(4), 26-35.
13. von Schwarzenberg, Karin, and Angelika M. Vollmar. "Targeting apoptosis pathways by natural compounds in cancer: Marine compounds as lead structures and chemical tools for cancer therapy." Cancer letters 332, no. 2 (2013): 295-303.
14. Mehta, I., & Dutta, S. (2024). Intergenerational Cultural Transmission in Rapidly Globalizing Societies. Progression Journal of Human Demography and Anthropology, 2(2), 9-12.
15. Dyshlovoy, Sergey A., and Friedemann Honecker. "Marine compounds and cancer: Updates 2020." Marine Drugs 18, no. 12 (2020): 643.

16. Jain, A., & Chatterjee, D. (2025). The Evolution of Anatomical Terminology: A Historical and Functional Analysis. Global Journal of Medical Terminology Research and Informatics, 2(3), 1-4.
17. Nobili, Stefania, Donatella Lippi, Ewa Witort, Martino Donnini, Letizia Bausi, Enrico Mini, and Sergio Capaccioli. "Natural compounds for cancer treatment and prevention." Pharmacological research 59, no. 6 (2009): 365-378.
18. Singh, K., & Venkatesan, L. (2024). Membrane Filtration in Continuous Pharmaceutical Manufacturing: Challenges and Solutions. Engineering Perspectives in Filtration and Separation, 2(2), 15-18.
19. Beesoo, Rima, Vidushi Neergheen-Bhujun, Ranjeet Bhagooli, and Theeshan Bahorun. "Apoptosis inducing lead compounds isolated from marine organisms of potential relevance in cancer treatment." Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis 768 (2014): 84-97.
20. Ashour, M. (2024). Zero-trust architectures in enterprise networks: A comprehensive framework for next-generation cybersecurity. Electronics, Communications, and Computing Summit, 2(3), 18–27.
21. Velliangiri, A. (2025). Reinforcement Learning-Based Adaptive Load Forecasting for Decentralized Smart Grids. National Journal of Intelligent Power Systems and Technology, 1(1), 21-28.
22. Velliangiri, A. (2025). Bioenergy from Agricultural Waste: Optimizing Biomass Supply Chains for Rural Electrification. National Journal of Renewable Energy Systems and Innovation, 18-26.
23. Muralidharan. J. (2025).Condition Monitoring of Electric Drives Using Deep Learning and Vibration Signal Analysis. National Journal of Electric Drives and Control Systems, 23-31.
24. Rahim, R. (2025). AI-Driven Fault Diagnosis in Three-Phase Induction Motors Using Vibration and Thermal Data. National Journal of Electrical Machines & Power Conversion, 21-28.
25. Reginald, P. J. (2025). Hybrid AC/DC Microgrid Power Management Using Intelligent Power Electronics Interfaces. Transactions on Power Electronics and Renewable Energy Systems, 21-29.
26. Rahim, R. (2025). Multi-Scale Modeling of Supercapacitor Performance in Hybrid Energy Systems. Transactions on Energy Storage Systems and Innovation, 1(1), 17-25.
27.