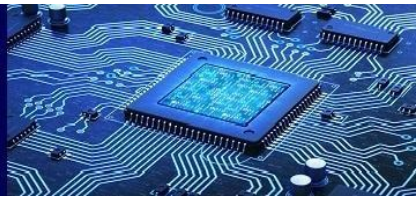
Journal of Current Research in Engineering and Science
Bi-Annual Online Journal ( ISSN: 2581 - 611X )



VOLUME:8, ISSUE:2, AUGUST 2025, PAPER NUMBER:26

# GREEN ENERGY: ELECTRICITY FROM PLANTS

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***Abstract* — *Sufficient power supply is vital for any nation's development, but to safeguard the planet for future generations, energy production must prioritize efficiency, sustainability, and renewability. This paper addresses the challenges posed by harmful and depletable energy sources for electricity generation by proposing a solution centered around plants as a sustainable and renewable energy source. The research aims to explore the feasibility of using plants to generate electricity and evaluate various plant materials and electrode combinations' effectiveness. By harnessing the natural energy potential of plants, this approach offers a promising avenue for clean and renewable energy production. Through rigorous experimentation and analysis, this research seeks to advance the understanding of plant-based electricity generation and pave the way for innovative and environmentally friendly energy solutions.***

***Keywords* — *Electricity, sustainable energy, eco-friendly, renewable energy, anode, cathode.***

## 1. INTRODUCTION

Modern technology is evolving and has a significant impact on every aspect of human life. As technology advances, more people use the resources. When there is a potential difference between two points, electrons move between them to create electricity, which is a form of energy that allows for the generation of an electric current. Electricity is simply the flow of electrical charge or power. Energy-saving

refers to the effort to use less energy in an effort to lower energy consumption. Either reducing the amount of service consumed or making better use of renewable energy sources can accomplish this. The goal of this research is to produce power using plants and evaluate the effectiveness of various plant materials and electrode combination. Both the environment and the plant are unaffected by the process. A basic process for harvesting weak electricity out of living plants has been accomplished by immersing electrodes by the side of plant, thereby completing the association to the conditioning circuit, from which the electrical energy is obtained.[3][1]

## 2. ENERGY AND ITS SOURCE

Electricity generation relies on three main categories of energy sources: fossil fuels, nuclear energy, and renewables. Fossil fuels like coal, natural gas, and petroleum have been central to global electricity production, combusted to create heat for driving turbines. Yet, their extensive use contributes to environmental issues like greenhouse gas emissions and air pollution, despite their reliability and affordability.

Nuclear energy, derived from reactions in materials such as uranium and thorium, represents another significant source. Nuclear power plants utilize controlled nuclear fission reactions to generate heat, emitting minimal greenhouse gases. However, challenges such as safety risks, radioactive waste management, and proliferation concerns persist.

Renewable energy sources offer sustainable alternatives. Solar, wind, hydroelectric, biomass, geothermal, and tidal energy harness natural processes with advantages like an inexhaustible supply and minimal environmental impact. Yet, challenges like intermittency and geographic limitations hinder widespread adoption, necessitating advancements in storage, grid integration, and policy support for a transition to renewables.

Energy sources have both benefits and drawbacks, as they can harm the environment and may become depleted over time. While renewable energy sources offer significant advantages, such as sustainability and reduced environmental impact, they also present challenges. For example, solar energy generation can be limited on cloudy or rainy days, highlighting the intermittency issue associated with renewables. Despite these limitations, ongoing advancements in technology and infrastructure aim to address these challenges and enhance the reliability and efficiency of renewable energy systems**.**

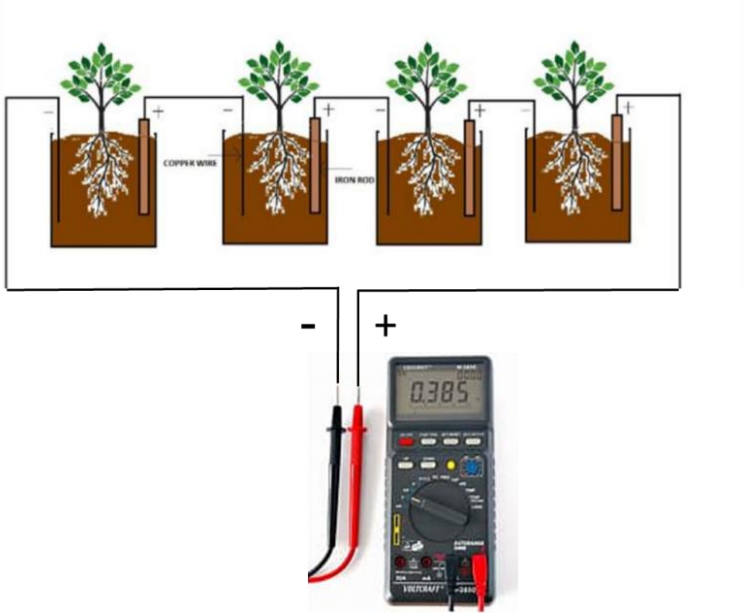
## 3. ELECTRICITY FROM PLANTS

The concept of generating electricity from living plants involves the strategic placement of an anode and cathode near the plant's root system. This arrangement

capitalizes on the natural processes within the plant to facilitate electricity generation. Specifically, the positively charged anode attracts protons, while the negatively charged cathode attracts electrons. This movement of charged particles creates a flow of electricity between the electrodes.

The voltage generated through this process varies depending on several factors, including the materials used for the electrodes and the selection of plant species. For instance, experiments have shown that certain plants with high rates of photosynthesis, such as Teak, have the potential to produce significant voltages. In the case of Teak plants, a voltage of 2.427V was achieved, which is notably five times more efficient than conventional electricity production methods. Importantly, this approach to electricity generation from living plants offers a clean and sustainable alternative, devoid of pollution typically associated with traditional energy production methods.

In addition to Teak, various other plant species have demonstrated the ability to yield high voltages due to their robust photosynthetic processes. Plants like Thulasi and Aloe vera are examples of species that have shown promise in generating substantial voltages when used in this context. This diversity in plant selection opens up opportunities for further exploration and optimization of plant-based electricity generation systems.[4]




The selection of materials for the anode and cathode also plays a crucial role in determining the efficiency and output of the electricity generation process. Different combinations of materials, such as Cu-Fe, Au-Zn, or Ag-Al, can impact the voltage and current characteristics of the system. By carefully selecting and experimenting with these electrode materials, researchers can fine-tune the performance of plant-based electricity generation systems to achieve optimal results.[2]

To quantify the power output of these systems, a simple power calculation can be employed. Power is calculated as the product of voltage and current, expressed in watts. For example, using the voltage generated from the Teak plant experiment (2.427V) and a measured current of 10.4 amperes, the calculated power output would be approximately 25.2408 watts. This demonstrates the potential of plant-based electricity generation systems to deliver meaningful power output levels suitable for practical applications.

# 4. ELECTRODE SELECTION

Based on an analysis of experiment data, the electrode that produced a high voltage from a single plant was chosen. Here's a table with electrode combinations tested on various plants.

For Thulasi Plant:

| Anode | Cathode | Voltage |
|---|---|---|
| Copper | Nickel | 2.2 |
| Iron | Zinc | 2.3 |
| Cobalt | Chromium | 2.5 |

For Aloe Vera Plant:

| Anode | Cathode | Voltage |
|---|---|---|
| Copper | Nickel | 2.1 |
| Iron | Zinc | 2.2 |
| Cobalt | Chromium | 2.4 |

It can be seen that the electrode pair of Cobalt as anode and Chromium as cathode gives the maximum voltage of 2.5V from Thulasi plant and 2.4V from Aloe vera plant. There are several electrode combinations in addition to this.[3]

# 5. MOTIVE OF PLANT ENERGY

Encouraging the use of renewable resources plays a crucial role in minimizing environmental destruction and preserving natural habitats. Plant energy emits significantly lower levels of greenhouse gases compared to fossil fuels, mitigating air pollution and combating climate change. By transitioning to renewable energy sources, we can conserve precious energy and natural resources, ensuring their availability for future generations while reducing our ecological footprint.

Furthermore, advocating for initiatives that promote green spaces and encourage plant growth in households can significantly contribute to environmental conservation. Increased vegetation not only enhances air quality but also promotes biodiversity and ecosystem resilience. It fosters a deeper connection with nature and creates more sustainable living environments.

Ultimately, the widespread adoption of renewable resources fosters a culture of environmental stewardship and sustainability. It encourages innovation in clean energy technologies, drives economic growth, and empowers communities to embrace environmentally responsible practices. By prioritizing renewable energy and green initiatives, we can collectively work towards a healthier planet and a brighter future for generations to come.

## 6. ADVANTAGES OF PLANT ENERGY

Plant based electricity generation represents a novel approach to energy production, emphasizing sustainability and minimal environmental impact. This method ensures that electricity is generated without causing harm to plants, providing a renewable and sustainable energy source. With its simplicity and efficiency, plant based energy offers a cost-effective alternative to traditional energy sources, boasting a straightforward installation process compared to complex infrastructure required by other methods. Its environmental benefits and straightforward implementation make it an attractive option for communities striving for accessible and eco-friendly power solutions. Furthermore, embracing plant energy aligns with global initiatives aimed at transitioning to cleaner and more sustainable energy systems, offering a viable pathway to reduce pollution and mitigate climate change.

## 7. FUTURE SCOPES OF PLANT ENERGY

In considering the future scope for electricity from living plants, several promising avenues emerge for further exploration and application. One significant area of research involves enhancing the interface between plants and electrodes to optimize energy transfer efficiency, thereby increasing electricity generation from living plants. Additionally, bioengineering techniques offer potential for developing specialized plant species or genetically modifying existing plants to produce higher energy yields, driving advancements in plant's electricity production. Integrating plant based electricity generation with smart grid technologies could revolutionize energy distribution and management, enhancing efficiency and sustainability.

Looking ahead, there is significant potential to scale up plant-based electricity generation for commercial and industrial applications, offering sustainable and decentralized energy solutions. Furthermore, beyond electricity generation, plant-based systems could be leveraged for environmental monitoring and restoration efforts, harnessing the natural abilities of plants to provide both energy and ecological benefits. Overall, the future scope for electricity from living plants holds promise for innovation and sustainability in the energy sector, with potential applications ranging from small-scale household electricity generation to large-scale industrial and environmental projects.

# 8. CONCLUSION

In conclusion, the concept of generating electricity from living plants offers a promising avenue for clean, sustainable energy production. By leveraging natural processes within plants and optimizing the design and materials of electrode systems, significant voltage levels can be achieved. These advancements hold potential for revolutionizing energy production methods, offering a greener alternative to conventional electricity generation while minimizing environmental impact.

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