Commentary

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Promoting Sustainable Agriculture: The Need for Recycling Single-Use Primary Batteries

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ABSTRACT

As the world grapples with the challenges of sustainable development, it is crucial to address the environmental impacts of various industries. We at Aloe Ecell are working to solve the problems caused by single used hazardous dry cell batteries. Sustainable agriculture, in particular, calls for innovative solutions that minimize resource consumption and waste generation. This article highlights the need for recycling single-use primary batteries in the context of sustainable agriculture. It also showcases the efforts of Aloe Ecell, a pioneering company committed to making a better battery world.

Introduction

In our daily lives, batteries are indispensable. In accordance with their capacity for electrical recharging, they are divided into primary, i.e non-rechargeable batteries and secondary i.e rechargeable batteries. The widespread use of batteries in a variety of products-from basic gadgets to cutting-edge technologies—highlights their necessity in contemporary living. However, this extensive use also prompts questions about how to properly manage battery waste. Now the first thing that springs to mind when we discuss the issues with batteries and the need for recycling them is either a large lead acid battery or a lithium battery, but what about single-use hazardous primary batteries? [1-7]. The data on domestic, regional and global production of new batteries and amount of waste batteries produced are hardly available. There are varying estimates here and there for some countries in news articles, blogs, factsheets or recycling companies' websites. Over 12 billion disposable batteries were sold worldwide in 1993. This figure reached 40 billion batteries in 2006. The total battery sales data for United Kingdom in year 2003 indicates that primary batteries constituted 79.12% (19,662 tons) of total sales, of which largest market share (59.96%) was acquired by alkaline manganese batteries and the secondary batteries accounted for 20.87% (5,188 tons) of total annual sales. The primary battery market is expected to register a CAGR of 7.02% during the forecast period of 2022–2027, reaching approximately USD 21.97 billion by 2027, up from USD 14.24 billion in 2020.Under the Solid Waste Management rules the single used primary batteries are mentioned as domestic hazardous waste, but the unavailability of proper collection mechanism in India cause the improper disposal of these batteries, ending up in landfills. A study was conducted in Delhi, in which the households surveyed in Delhi dispose of used batteries in regular dustbins, without proper segregation, which ultimately leads to their disposal in landfills. Unfortunately, current regulations primarily focus on large lead-acid batteries, leaving a regulatory gap for the recycling and responsible disposal of small batteries commonly found in cameras, clocks, mobile phones, and other devices. These small batteries contain various metals such as zinc, lithium, nickel, lead, and cadmium, which pose significant environmental and health risks when not recycled or managed appropriately [8-12].

The Environmental Impact of Single-Use Primary Batteries

Accurate data on global battery production and waste generation is scarce, but estimates provide insights into the scale of the issue. The global battery market has witnessed significant growth, with billions of disposable batteries being sold annually. Different countries exhibit varying consumption patterns, with primary batteries accounting for a considerable share. In India, the dry cell market was projected to reach a value of approximately $8.6 billion USD by 2022, with zinc-carbon cells dominating the market at 97%. According to recent reports, up to 90% of zinc-carbon cells used in batteries annually in India end up in landfills, ultimately contaminating soil, water sources, and the food chain. The corrosion of battery casings exposes heavy metals, which can have severe consequences for human health, ranging from neurological impacts to kidney damage and even cancer. One single battery can pollute approximately 1.67 lakh liters of drinking water. Along with environmental impact, we also lose valuable non-renewable resources too. The extraction and production of raw materials for battery manufacturing also contribute to carbon emissions and environmental degradation. Recycling these batteries becomes imperative to mitigate their environmental impact.

The Need for Battery Recycling in Sustainable Agriculture

Soil degradation and nutrient deficiencies are major concerns for sustainable agriculture globally, with India facing similar challenges. In particular, micronutrient deficiencies, including zinc, boron, and manganese, have been identified as critical limitations to achieving optimal crop productivity. These deficiencies are prevalent in Indian soils, with over 50% of agricultural lands exhibiting inadequate levels of micronutrients. The semi-arid regions of India, such as Rajasthan, are particularly susceptible to micronutrient deficiencies due to low soil organic matter content, alkaline pH, and limited soil moisture availability. To combat the problems of micronutrient deficiencies and waste caused by battery we have come up with a sustainable solution. Recycling single-use primary batteries offers several benefits for sustainable agriculture. Firstly, it reduces the release of hazardous substances into the environment, preventing soil contamination and water pollution. Secondly, it conserves valuable resources by recovering materials like zinc, manganese, and potassium, which can be reused in battery production or other industries. Thirdly, recycling batteries decreases the carbon footprint associated with the extraction and production of raw materials. The market-available micronutrient fertilizers are produced using metals that have been extracted through mining, which led to the release of hazardous greenhouse gases. Aloe Ecell Pvt Ltd produces micronutrient fertilizers (Mangnify, Zinkify, and Multify) that are both cost-effective and carbon negative.

Aloe Ecell: Leading the Way in Sustainability

Aloe Ecell is a trailblazing company dedicated to making a better battery world by providing a complete solution to the problems of dry cell batteries through our circular ecosystem of Make, Track and Recycle. Under these initiatives:

1. We make eco-friendly aloe vera batteries.
2. Track and collect the existing single use hazardous primary batteries through our power pledge program from NGOs, Schools, Private organizations etc.
3. Recycle the collected batteries into sustainable products. India's first recycled micronutrient fertilisers Mangnify, Zinkify, and Multify from spent batteries.

Our unwavering commitment to sustainability drives our core values, and our ongoing research and development efforts have enabled us to develop innovative solutions to address the harmful waste caused by single-use primary batteries. We are dedicated to continuously improving and advancing our technologies to minimise environmental impact and promote a circular economy. We strive to create a better future by reducing waste, conserving resources, and mitigating the negative effects of battery disposal. Our commitment to sustainability remains steadfast, and we will continue to push the boundaries of innovation to achieve our mission of a greener and more sustainable battery industry [13-18].

Conclusion

Addressing the adverse ecological consequences of various businesses, including the battery industry, is necessary to support sustainable agriculture. Recycling single-use primary batteries is essential in this situation because it lessens carbon emissions from the extraction of raw materials, prevents soil contamination, reduces hazardous waste, and conserves important resources. By providing environmentally friendly aloe vera batteries, developing a power pledge programme to track and collect hazardous batteries, and recycling them into sustainable products, Aloe Ecell, a pioneering firm, is setting the standard for sustainability.

Conflict of Interests

The authors declare no competing interest.

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Author Contributions

Aparna Valson: Aparna Valson is the corresponding author of the article and conducted the experiment, collected data, and analyzed the results. Aparna Valson also played a significant role in the development and production of the fertilizers mentioned in the article.

Nimisha Varma: Nimisha Varma contributed to the review and analysis of the research paper and results. Nimisha Varma also played a significant role in the development and production of the fertilizers mentioned in the article.

Naveen Suman: Naveen Suman contributed to the review and analysis of the research paper and results. Naveen Suman also played a significant role in the development and production of the fertilizers mentioned in the article.

Data Availability Statement

The data for the above commentary article is available in our research paper. Aparna Valson, Nimisha Varma, Naveen Suman, (2023), From Waste to Wheat: The Impact of Recycled Manganese Sulfate from Zinc-Carbon Batteries on Water-Stressed Wheat Cultivation, J, Biotechnology and Bioprocessing, 4(1); DOI: 10.31579/2766-2314/095.

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