

Efficacy of Sabila (*Aloe Vera*) in Electromagnetic Absorption in Households

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Article History	Abstract
<p>Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 03 Nov 2023</p>	<p>A documentary review was carried out on the production and publication of research papers related to the study of the variables Aloe Vera and Radiation Absorption. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the period 2012-2022, achieving the identification of 18 publications. The information provided by this platform was organized through graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics have been described, the position of different authors towards the proposed theme is referenced through a qualitative analysis. Among the main findings made through this research, it is found that India, with 11 publications, was the country with the highest scientific production registered in the name of authors affiliated with institutions of that nation. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of the variables Aloe Vera and the absorption of radiation, was Pharmacology, Toxicology and Pharmaceutical with 6 published documents, the same presented under the theories of Chemistry. The most used Type of Publication during the period indicated above were Journal Articles with 61% of the total scientific production.</p>
<p>CC License CC-BY-NC-SA 4.0</p>	<p>Keywords: Aloe Vera, Radiation Absorption, Electromagnetic.</p>

1. Introduction

In today's era of digital evolution, the proliferation of modern electronic devices and new wireless communication technologies whose benefits are innumerable, and are in every home to make our lives easier; However, this unprecedented explosion of electromagnetic radiation generates a constant concern about the possible future health risks of prolonged exposure to electromagnetic radiation that becomes an invisible enemy when living with mankind in their homes, since radiation between 30 kHz and 300 MHz and microwaves between 300 MHz and 300 GHz, cause vibrations or molecular alterations (Soto e Hinojosa, 2021). As society becomes increasingly dependent on these devices and wireless networks, there is an undeniable need to find effective strategies aimed at mitigating the negative effects of electromagnetic radiation present in the devices; in this context, aloe vera is a

succulent plant, scientifically known as Aloe vera, appreciated since ancient times, and still widely used in many fields of human and animal medicine, since the chemistry of this plant has revealed more than 200 different bioactive compounds that have a great therapeutic property, not only this, but it contains 7 of the 8 essential amino acids that the body cannot produce, being very important the inner part of the leaf that contains a large amount of phytochemicals (Rawat y Saxena 2023; Isaqov y Mamatyusupova, 2022; Martínez et al. 2022).

Recent research has delved into their lesser-known functions, in particular their potential to absorb electromagnetic radiation (Lișiță y Maravela, 2022). This property of Aloe Vera promises to be a sustainable and natural solution to the growing problems associated with exposure to electromagnetic radiation, even electromagnetic pollution from wireless devices can also affect circadian rhythms (Martel et al., 2023), this radiation, which ranges from extremely low frequencies to radio frequencies and microwaves, is emitted by various sources such as cell phones, routers, Wi-Fi, power lines and electronic devices (Islam et al., 2023).

According to Davis et al. (2023), many widely used devices, such as phones and tablets, function as two-way microwave radios, sending and receiving various frequencies of microwave radiation carrying information on multiple antennas operating simultaneously. Prolonged exposure to electromagnetic radiation has been linked to a number of health problems, including an increased risk of cancer, neurological disorders, and reproductive problems (Jangid et al., 2023), as society continues to rapidly integrate electronic technology, the potential health risks associated with electromagnetic radiation will increase; therefore, there is an urgent need to explore innovative ways to reduce the risks of e-health and its potential adverse effects.

Recent studies by Chandrika et al. (2023) indicate that bismuth-zinc-iron (BiZnFe) nanocomposites (NCs) have been synthesized for the first time using a solution combustion approach and aloe vera extract as a reducing agent, and UV light absorption was observed in the wavelength region of 200 to 300 nm, and the direct energy bandgap was determined as 3.06 eV, thus the ability of BiZnFe NCs to protect against various types of radiation, i.e. X-rays/gamma rays, bremsstrahlung and neutrons, has been evaluated. The extraordinary ability of Aloe vera to absorb electromagnetic radiation lies in its unique chemical composition, as it contains a gelatinous substance extracted from inside the leaf, rich in polysaccharides, amino acids, vitamins and minerals, as well as a variety of bioactive substances in its chemical composition such as anthraquinones, enzymes, saponins, lignins and salicylic acid, which interact and reduce harmful effects on organisms (Akhtar et al., 2023).

In addition, Aloe Vera has antioxidant properties that neutralize free radicals caused by exposure to electromagnetic radiation, which further enhances its protective effects (Nesreen et al., 2023).

The effectiveness of Aloe Vera in absorbing electromagnetic radiation offers a new, environmentally friendly way to mitigate these risks, so that understanding the mechanisms and practical applications of Aloe Vera in the absorption of electromagnetic radiation is not only of scientific interest, but is also very promising for improving the quality of life in an increasingly connected world; reason why the present study aims to analyze from a bibliometric and bibliographic perspective, the research papers in high impact journals indexed in the Scopus database on the variables Aloe Vera and Electromagnetic absorption, during the period 2016-2023.

2. Materials And Methods

It explored the scientific evidence supporting the phenomenon of electromagnetic radiation absorption, explaining the mechanisms by which Aloe Vera interacts with electronic health hazards and discussing its potential applications in a variety of settings, including personal electronic devices, home environments and industrial settings, further exploring, the possibility of integrating Aloe vera-based solutions into existing electronic medical hazard conservation strategies, and testing the environmental sustainability of such an approach. This article is carried out through research with mixed orientation that combines the quantitative and qualitative method.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of the scientific production corresponding to the study of Aloe Vera and Radiation Absorption.

A qualitative perspective, examples of some research work published in the area of study indicated above, starting from a bibliographic approach that allows to describe the position of different authors towards the proposed topic. It is important to note that the entire search was performed through Scopus, managing to establish the parameters referenced in *Figure 1*.

Methodological design



Figure 1. Methodological design

Source: Own elaboration.

Phase 1: Data collection

Data collection was executed from the Search tool on the Scopus website, where 18 publications were obtained from the choice of the following filters:

TITLE-ABS-KEY (aloe AND vera, AND radiation AND absorption) AND PUBYEAR > 2015 AND PUBYEAR < 2024

- Published documents whose study variables are related to the study of Aloe Vera and Radiation Absorption.
- Limited to the years 2016-2023.
- Without distinction of country of origin.
- Without distinction of area of knowledge.
- Regardless of type of publication.

Phase 2: Construction of analysis material

The information collected in Scopus during the previous phase is organized and subsequently classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Year of publication.
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

Phase 3: Drafting of conclusions and outcome document

In this phase, we proceed with the analysis of the results previously yielded resulting in the determination of conclusions and, consequently, the obtaining of the final document.

3. Results and Discussion

Co-occurrence of words

Figure 2 shows the Co-occurrence of keywords found in the publications identified in the Scopus database.

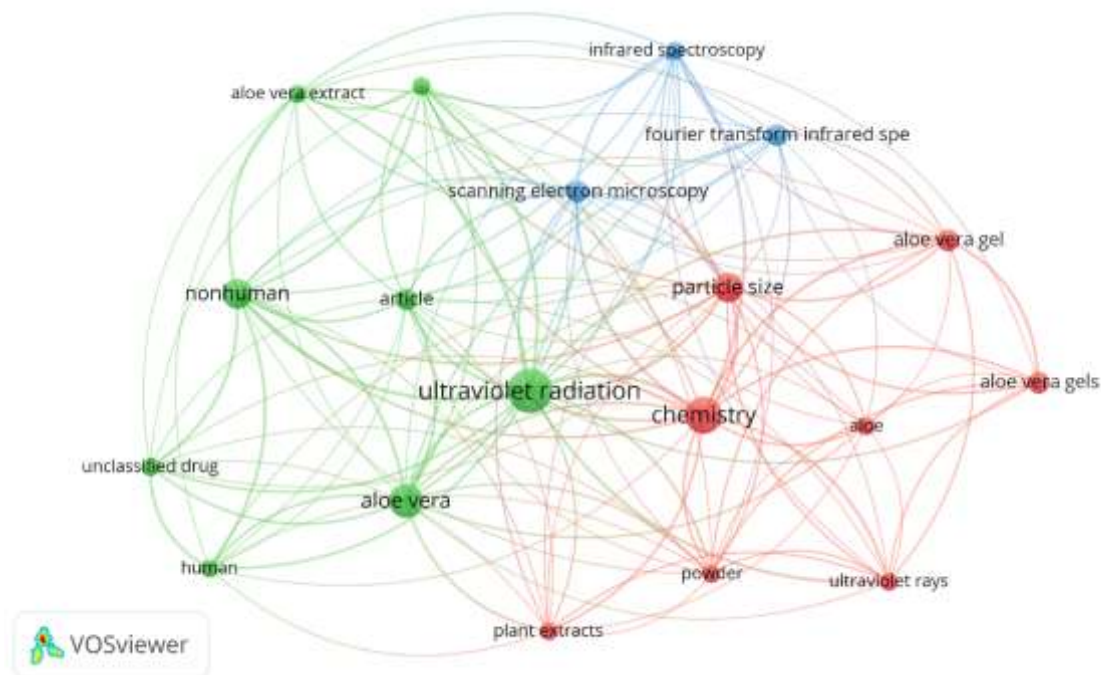


Figure 2. Co-occurrence of words

Source: Own elaboration (2023); based on data exported from Scopus.

Ultraviolet radiation was the most frequently used keyword within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Aloe Vera is among the most frequently used variables, associated with variables such as Plant Extracts, Chemistry, Electromagnetic Radiation, Scanning Electron Microscope, Particle Size. From the above, it is important to note that exposure to electromagnetic radiation can have detrimental effects on health, such as increased risk of cancer, sleep disorders, oxidative stress and cell damage, coinciding with the assertion of Hae et al. (2023), who state that exposure to high levels of IF-EMF at relatively high frequencies can cause thermal damage (a slow process when tissues are kept warm for prolonged periods); However, the most obvious risk at this frequency is that of cell membrane stimulation, as this non-thermal effect is related to changes in membrane potential induced by exposure to external electromagnetic fields and may affect/stimulate peripheral nerves and muscle cells, to name a few examples, and it is advisable to keep an adequate distance from electronic devices and use protective devices, if necessary.

Articles such as the one entitled “Linear and Nonlinear Optical Properties of PVA:SA Blend Reinforced by TiO₂ Nanoparticles Prepared by Flower Extract of Aloe Vera for Optoelectronic Applications” (Khalil et al., 2023) mentioned the use of Aloe vera extract as a natural protective agent for TiO₂ nanoparticles, as well as a reducing agent for TiO₂ nanoparticles; on the other hand, the use of Aloe vera extract as a natural protective agent for TiO₂ nanoparticles, as well as a reducing agent for TiO₂ nanoparticles, was also mentioned, Rajkurami et al. (2019) obtained spherical, polydispersed biosynthesized TiO₂ nanoparticles with a size ranging from 20 to 50 nm using the leaf extracts of Aloe barbadensis mill, so that they showed that the carboxylic acids of the main phytochemical of the Aloe vera leaf extract represented by Fourier transform infrared spectra (FTIR) analysis, which also indicate the presence of terpenoids, flavonoids and proteins, could help in the formation and fabrication of the biosynthesized TiO₂ nanoparticles, thus acting as a capping and reducing agent in the biosynthesis process; in agreement with Syamsutajri et al. (2021) who state that plant extracts are used to focus on the principles of green chemistry, such as Aloe vera, Neem, Lemon verbena, Indian gooseberry, Tulsi and Coriandrum.

Distribution of scientific production by year of publication

Figure 3 shows how scientific production is distributed according to the year of publication.

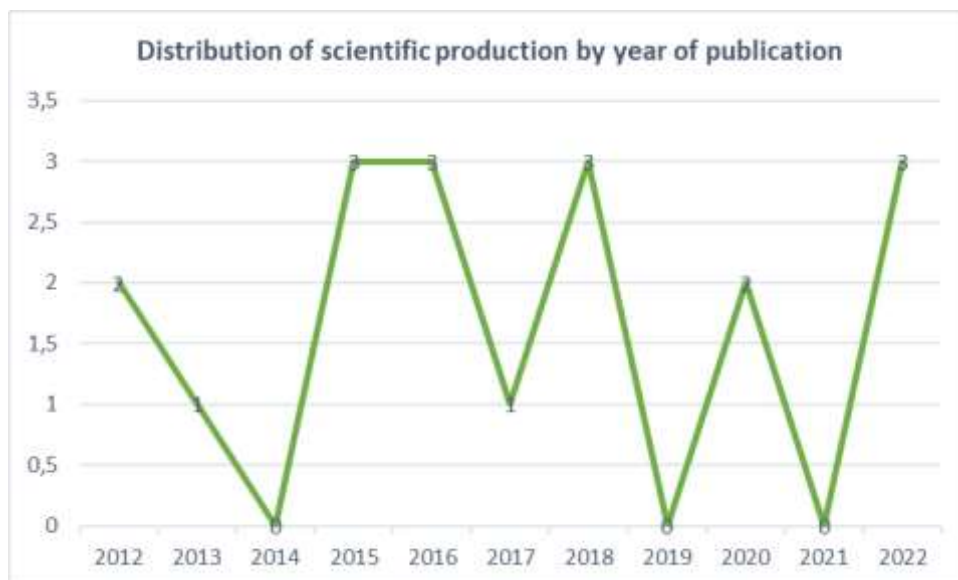


Figure 3. Distribution of scientific production by year of publication.

Source: Own elaboration (2023); based on data exported from Scopus

This article investigates the use of *A. vera* extract as a natural protective agent for TiO₂ nanoparticles, as well as reducing agent for TiO₂ nanoparticles. XRD, diffuse ultraviolet reflectance (UV-DRS), Fourier transform infrared spectroscopy (FT-IR), transmission electron microscopy (TEM), scanning electron microscopy (SEM) and energy dispersive X-ray analysis (EDXA) were used to characterize the material. In their X-ray diffraction patterns, the titanium dioxide nanoparticles were found to have a high degree of crystallinity, indicating that they were synthesized. Infrared spectra (FT-IR) were used to determine the chemical composition of the plant extract. DRS spectra in the UV-visible range reveal a high absorption peak at 356 nm, indicating the existence of TiO₂ nanoparticles in the sample. The shape of the nanoparticles was revealed by SEM and TEM morphological investigations, which revealed their irregular and somewhat spherical nature. Only titanium and oxygen compounds were found in the EDX spectrum, indicating that they were present. This shows that the NPs that were produced are free of contaminants. Using the produced nanoparticles as a catalyst, in this paper we present a photocatalytic degradation method for methylene blue dye. The findings showed that 94 percent of the damage occurred within 120 minutes of exposure to ultraviolet radiation (Srujana, 2022).

Distribution of scientific production by country of origin.

Figure 4 shows how scientific production is distributed according to the nationality of the authors.

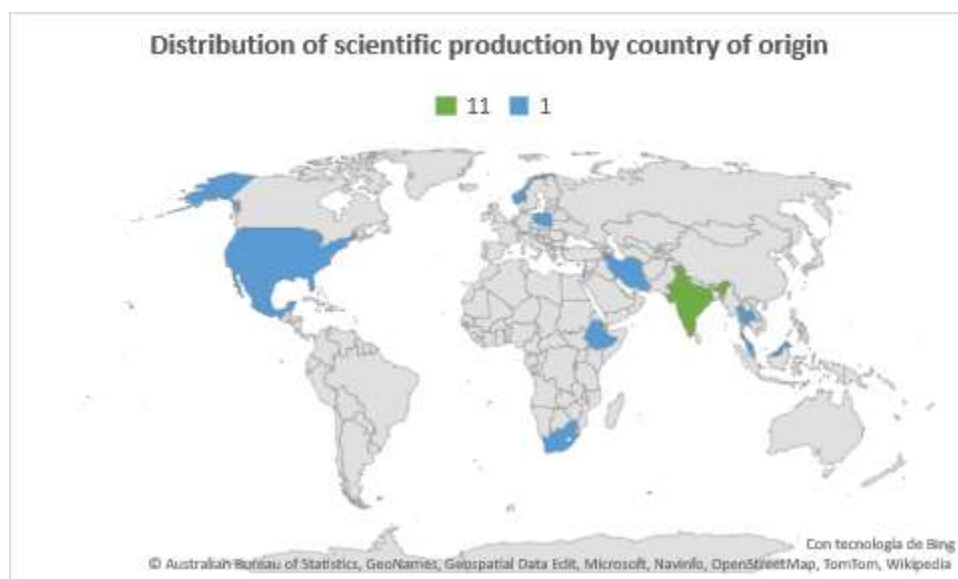


Figure 4. Distribution of scientific production by country of origin.

Source: Own elaboration (2023); based on data provided by Scopus.

Distribution of scientific production by area of knowledge

Figure 5 shows the distribution of the elaboration of scientific publications from the area of knowledge through which the different research methodologies are implemented.

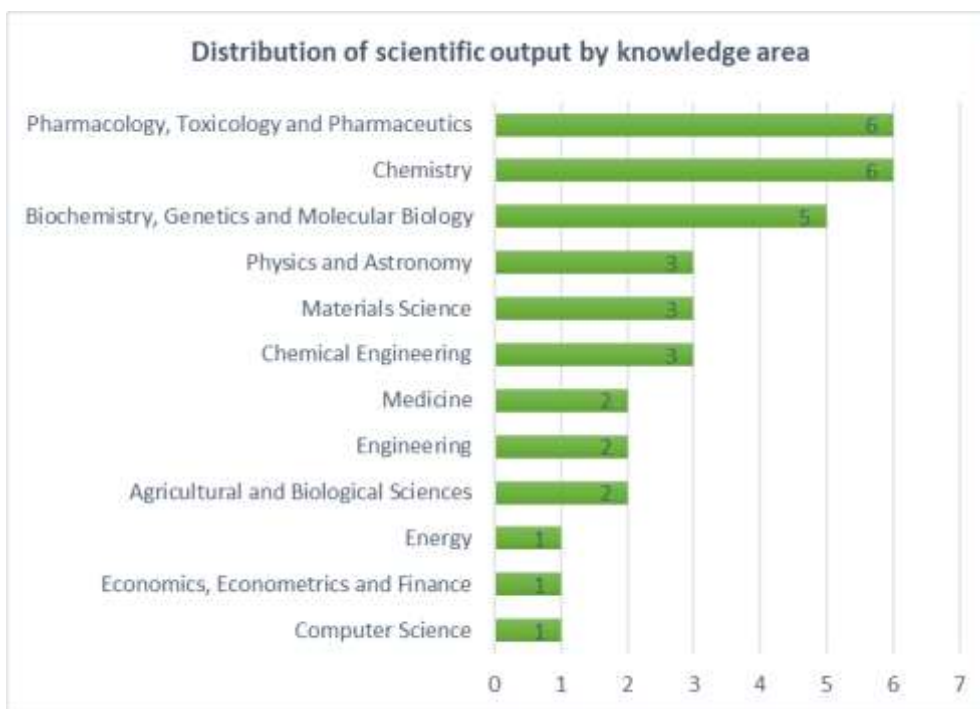


Figure 5. Distribution of scientific production by area of knowledge.

Source: Own elaboration (2023); based on data provided by Scopus.

The article with the greatest impact was registered by the area of Pharmacology, Toxicology and Pharmacy entitled "UV blocking potential of oils and juices." This study explores the potential of fruit and vegetable oils and juices as substitutes for these compounds. Methods: The absorptivity of various oils (canola oil, citronella oil, coconut oil, olive oil, soybean oil, vitamin E and Aloe Vera) and fruit and vegetable juices (acerola, beets, grapes, orange carrot, purple carrot). and raspberry) was measured in vitro. Mean absorptivity was compared with FDA-approved UV absorbers to measure the potential of natural products. The most promising candidates were incorporated into the formulations and the UV transmittance of a 20 µm thick film of the formulation was measured. Formulations were also imaged by light microscopy and scanning electron microscopy. Results: The absorptivity of the oils was at least two orders of magnitude lower compared to commercial UV blockers. Fruit juice powders were more effective at blocking UV rays, but still showed an order-of-magnitude lower absorptivity compared to commercial UV blockers (Gause, 2016).

Type of publication

In the following graph, you will observe the distribution of the bibliographic finding according to the type of publication made by each of the authors found in Scopus.

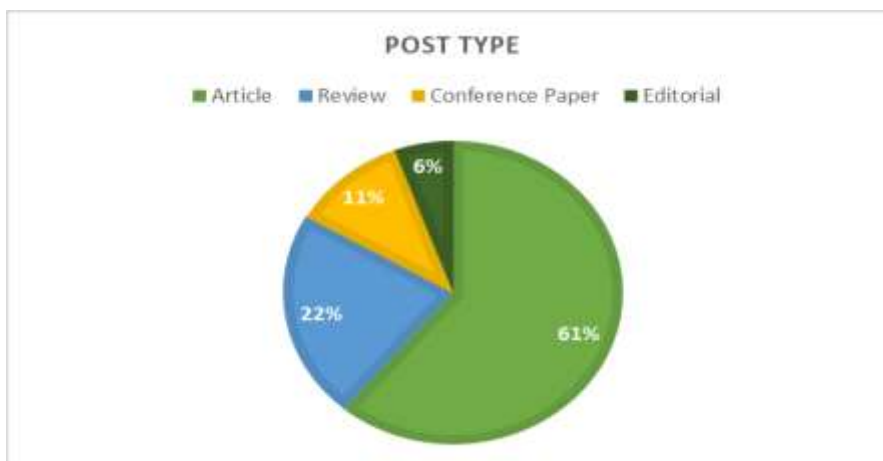


Figure 6. Type of publication.

Fountain: Own elaboration (2023); based on data provided by Scopus.

Aloe vera gel increased in vitro skin penetration of compounds depending on their molecular weights, with an apparent inverse correlation between the enhancement ratio and the molecular weight of the compound. Some components of Aloe vera's own gel also penetrated the skin and, interestingly, this depended on the molecular weight of the co-applied compounds. In agreement with what was stated by (Genesi et al., 2023), who corroborated the hypothesis of the development of superior chitosan films combined with aloe vera or copaiba oil for wound healing, since chitosan films are commonly used for wound dressings, provided that this polymer has wound healing, mucoadhesive and antimicrobial properties. These properties can be further enhanced by the combination of chitosan with polysaccharides and glycoproteins present in Aloe vera. Thus, the penetration-enhancing effect of aloe gel was explained by a probable attraction effect of the complexes formed between the compound and the enhancing agent within the aloe gel, but it was stated that the proposed mechanism of action needs to be further investigated and confirmed (Sharma, 2016).

4. Conclusion

The effectiveness of Aloe Vera in electromagnetic absorption, is a topic that requires more research. Although some studies suggest that Aloe Vera may have certain properties that can absorb or reduce electromagnetic radiation, the available evidence is limited and often inconclusive. Several studies have reported that Aloe Vera gel contains certain compounds, such as polysaccharides and antioxidants, which have been shown to have protective effects against oxidative stress caused by electromagnetic radiation. These compounds were found to scavenge free radicals and reduce DNA damage in cells exposed to electromagnetic fields. In addition, some studies have shown that aloe may have the ability to enhance the skin's natural defense mechanism to resist radiation. In addition, the efficiency of Aloe Vera in electromagnetic absorption can depend on a number of factors, such as the concentration and purity of the Aloe Vera used, the duration and strength of the electromagnetic field, the duration and strength of the electromagnetic field and individual changes in the individual types and sensitive skin. Overall, while there are some promising findings that Aloe Vera may have the potential to absorb or mitigate electromagnetic radiation, larger and more rigorous studies are needed to determine its effectiveness.

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