Original Article

Use Of Scanning Electron Microscopic (SEM) And Transmission Electron Microscopic (TEM) Techniques Inside The Nodules Of The Endemic Legume Clitoria Brachystegia (Benth)

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Abstract

A systematic review was carried out on the production and publication of research papers on the study of Scanning Electron Microscopy Techniques (SEM) and Transmission (TEM) under the PRISMA approach (Preferred Reporting Items for Systematic reviews and Meta-Analyses). The purpose of the analysis proposed in the present document was to determine the main characteristics of the publications registered in the Scopus and Wos databases during the year and their scope in the study of the proposed variables, achieving the identification of 15 publications in total. Thanks to this first identification, it was possible to refine the results through the keywords entered in the search button of both platforms, which were SEM, TEM, BENTH reaching a total of 11 documents, already excluding duplicates and those that did not meet the analysis criteria. The identified scientific publications were analyzed hoping to know the main characteristics within the execution of research projects concerning the study of the use of scanning electron microscopic (SEM) and transmission electron microscopic (TEM) techniques in the internal components of the nodules of the endemic legume Clitoria brachystegia (Benth.).

Keywords: Inequality Gaps, Higher Education, Covid-19.

1. Introduction

The need to analyze microscopic particles imperceptible to the human eye arises from the interest in explaining the phenomena occurring at the cellular level in each object of study. To achieve this analysis, multiple techniques are usually implemented for this purpose, among which are the Scanning Electron Microscopic Techniques (SEM) which provide information on morphology and surface characteristics and Transmission Microscopic Techniques (TEM) with which it is possible to observe the internal structure and ultrastructural details. It is important to mention that both techniques are based on the operation of Electron Microscopes, whose amplification is achieved through a system of magnetic lenses and the source used to illuminate are electrons, as opposed to Light Microscopes, whose amplification is obtained through a system of conventional lenses and the source of illumination are photons (Elías, Avalos, Avalos, S.A.). (Elías, Avalos, & Riquelme, 2012).. The main characteristics of SEM and TEM techniques according to Orrego, among others, are the following (2002):

Transmission electron microscopy (TEM) mode in which electrons pass through a colored and very thin section of sample, a metal-carbon replica of a fractured surface, or a suspension of negatively colored particles on a thin plastic film.

Scanning electron microscopy (SEM) This technique takes advantage of the signals resulting from the interaction between the electron beam and the sample; the most commonly used in SEM are secondary and/or backscattered electrons and X-rays.

For its part, the endemic species Clitoria brachystegia (Benth.) a legume representative of the Fabaceae family, reported as endemic and endangered (FAO, 2015) which has been the subject of study by the scientific community due to the evolution of rhizobia to adapt to the need to nodulate its host plant under local conditions, mainly pH and nutrient availability in the soil (Cao, Wang, Zhao, Chen, & Wei, 2014). The association between the characteristics of Rhizobia and Leguminosae of this type, is considered a process with high levels of efficiency in biological nitrogen fixation (BNF) and may be able to supply up to 90% of the nitrogen requirements in the same (López-López, et al., 2012).. Therefore, it is of vital importance to know the research contributions related to the study of this type of plants using SEM and TEM techniques and which have been the most significant findings within the scientific production registered in the Wos and Scopus databases during the last years. This document presents the general compendium of scientific publications without distinction of year of publication, understanding that it is a little studied topic and it is expected to abstract the generation of new knowledge in similar areas under the treatment of related variables open to studies whose affiliation does not distinguish country of origin or area of knowledge.

2. General Objective

To analyze from a bibliometric and bibliographic perspective, the production of research works on the variable scanning electron microscopic (SEM) and transmission electron microscopic (TEM) techniques inside nodules of the endemic legume Clitoria brachystegia (Benth.) indexed in Scopus and Wos databases.

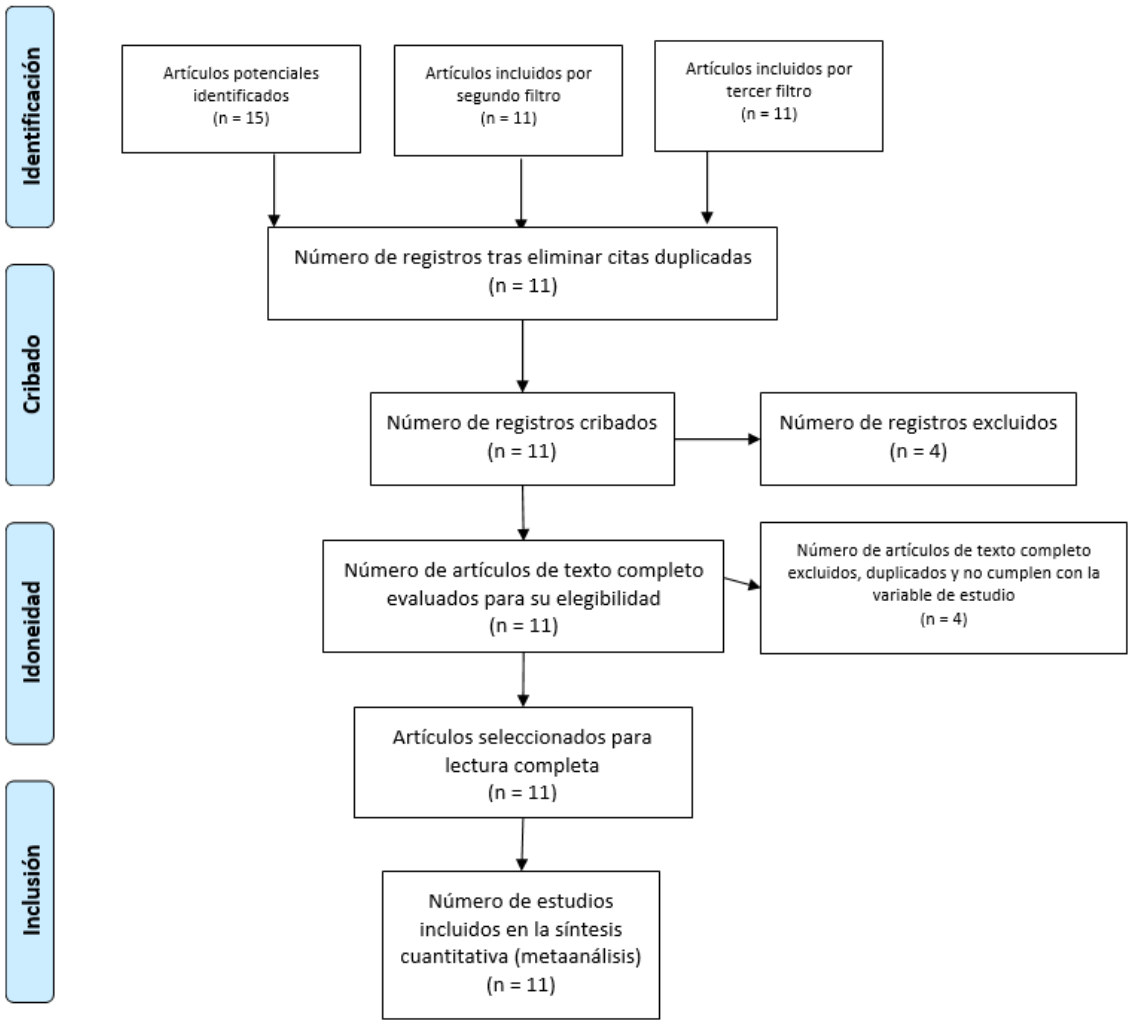
Methodology

The present research is of a qualitative type, according to Hernández, et al, (2015)(2015), qualitative approaches correspond to researches that perform the procedure of obtaining information to review and interpret the results obtained in such studies; for this purpose, the search for information was carried out in the Scopus and Wos databases by means of the words SEM, TEM, BENTH.

3.1 Research **design**

The research design proposed for the present research was the Systematic Review that involves a set of guidelines to carry out the analysis of the data collected, which are framed in a process that began with the coding to the visualization of theories (Strauss & Corbin, 2016) On the other hand, it is stated that the text corresponds to a descriptive narrative in that it is intended to find out how the levels of the variable affect; and systematic because after reviewing the academic material obtained from scientific journals, the theories on knowledge management were analyzed and interpreted (Hernández, Baptista, & Fernández, 2015)..

The results of this search are processed as shown in Figure 1, which expresses the PRISMA technique for the identification of documentary analysis material. It was taken into account that the publication was published without temporal delimitation, without distinction of country of origin of the publication, without distinction of area of knowledge, as well as any type of publication, namely: Journal Articles, Reviews, Book Chapters, Book, among others.



Flowchart of the systematic review conducted under the PRISMA technique (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). (Moher, Liberati, Tetzlaff, Altman, & Group, 2009)

Source: Own elaboration; Based on the proposal of the Prisma Group. (Moher, Liberati, Tetzlaff, Altman, & Group, 2009).

4. Results

Table 1 shows the results after applying the search filters related to the methodology proposed for this research, after recognizing the relevance of each of the referenced works.

No.	TITLE OF THE RESEARCH	AUTHOR/YEAR	COUNTRY	TYPE OF STUDY	INDICATION

1	Mechanism of action and biofilm inhibitory activity of lupinifolin against multidrug-resistant enterococcal clinical isolates	Sianglum, W., Muangngam, K., Joycharat, N., & Voravuthikunchai, S. P. (2019).	THAILAND	QUALITATIVE	SCOPUS
	Propagation of Streptosolen jamesonii (Benth.) Miers by stem cutting treated with IBA in different substrates	Pêgo, R. G., Fiorini, C. V. A., Machado, A. F. L., & Gomes, M. V. S. (2019).	BRAZIL	QUALITATIVE	SCOPUS
	Evidence for the dual role of floral secretory cells in bulbophyllum	Stpiczynska, M., & Davies, K. L. (2016).	POLAND, UNITED KINGDOM	QUALITATIVE	SCOPUS
	Antibacterial effect of component of Terminalia muelleri Benth. Against Staphylococcus aureus	Anam, K., Suganda, A. G., Sukandar, E. Y., & Kardono, L. B. S. (2010).	INDONESIA	QUALITATIVE	SCOPUS
5	In vivo localization of manganese in the hyperaccumulator Gossia bidwillii (Benth.) N. Snow & Guymer (Myrtaceae) by cryo-SEM/EDAX	Fernando, D. R., Batianoff, G. N., Baker, A. J., & Woodrow, I. E. (2006).	AUSTRALIA	QUANTITATIVE	SCOPUS
	Labellar anatomy and secretion in Bulbophyllum Thouars (Orchidaceae: Bulbophyllinae) sect. Racemosae Benth. & Hook. f.	Davies, K. L., & Stpiczyńska, M. (2014).	POLAND, UNITED KINGDOM	QUALITATIVE	WOS

	Nanoscale zeolitic imidazolate framework-8 encapsulates crude extract of Ajuga bracteosa wall ex. Benth and enhanced their antibacterial efficiency	Kumar, S., Kain, D., & Arya, A. (2021).	INDIA	QUALITATIVE	WOS
	Multifunctional theranostic applications of biocompatible green-synthesized colloidal nanoparticles	Ovais, M., Khalil, A. T., Raza, A., Islam, N. U., Ayaz, M., Saravanan, M., ... & Shinwari, Z. K. (2018).	PAKISTAN, SAUDI ARABIA, ETHIOPIA	QUANTITATIVE/QUALITATIVE	WOS
	Silver Nanoparticles Derived from Albizia lebbeck Bark Extract Demonstrate Killing of Multidrug-Resistant Bacteria by Damaging Cellular Architecture with Antioxidant Activity	Das Mahapatra, A., Patra, C., Mondal, J., Sinha, C., Chandra Sadhukhan, P., & Chattopadhyay, D. (2020).	INDIA	QUALITATIVE	WOS
	ENDOSYMBIOTIC CALCIFYING BACTERIA: A NEW CUE TO THE ORIGIN OF CALCIFICATION IN METAZOA?	Uriz, M. J., Agell, G., Blanquer, A., Turon, X., & Casamayor, E. O. (2012).	SPAIN	QUALITATIVE	WOS
	Dynamics of wood fall colonization in relation to sulfide concentration in a mangrove swamp	Laurent, M. C., Le Bris, N., Gaill, F., & Gros, O. (2013).	FRANCE	QUALITATIVE	WOS

Table 1. List of articles analyzed
Source: Own elaboration

4.1 Co-occurrence of words

Figure 2 shows the relationship between the keywords used for the search of the study material for the elaboration of the systematic analysis proposed for the present research.

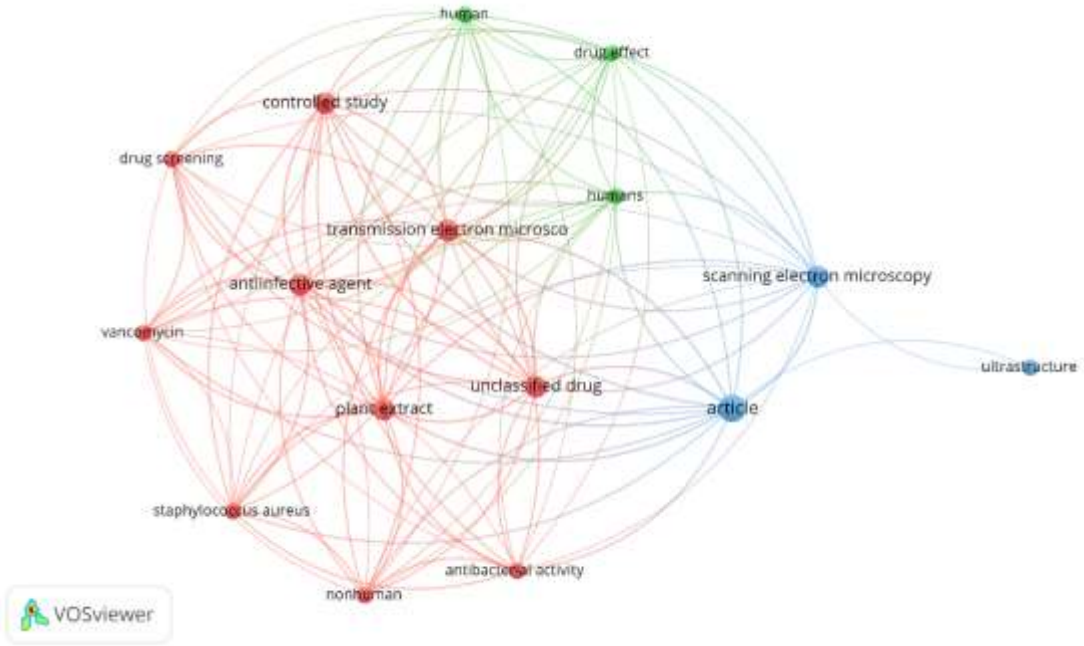


Figure 2. Co-occurrence of keywords.
Source: Own elaboration

The variables Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) represent the keywords mostly used within the research submitted for analysis in this document. In association with research in Ultrastructure, Articles, Antibacterial Activity, Plant Extract, which have been developed by researchers affiliated to institutions in India, Indonesia, Poland, among others. From the Latin American scientific community, it was only possible to identify research by authors from Brazil. However, it is important to emphasize that although scarce, it is expected that the generation of new knowledge about the variables mentioned above, will allow new findings in the study of the endemic legume Clitoria brachystegia (Benth.).

4.2 Discussion

The purpose of this article was to analyze from a systematic perspective, the contribution of the authors through their publications, to the study of Scanning Electron Microscopic Techniques (SEM) and Transmission (TEM) inside the nodules of the endemic legume Clitoria brachystegia (Benth.) carried out in high impact journals indexed in Scopus and Wos databases. It is important to mention that, under the same variables, no scientific evidence of studies that deepen the handling of both in a research environment was found, however, it is possible to highlight contributions such as the one obtained thanks to articles such as "Multifunctional theranostic applications of colloidal nanoparticles

synthesized in biocompatible green" (Ovais, et al., 2018) in which it is found how through the microscopic techniques under study, they were of great utility in the observation of the cellular behavior of different plants that proved to be of great help in the search for treatments to diseases, which represents a significant contribution for studies in biomedicine;

> "Aqueous extract was used as an effective stabilizing agent to produce biogenic silver (ON-AgNP) and gold nanoparticles (ON-AuNP), whose biocompatibility and potential biomedical applications were investigated (antibacterial, anticancer, antileishmania, enzyme inhibition)" (Ovais, et al., 2018).

Another success story presented in one of the articles listed in Table 1 is entitled "Dynamics of colonization by woodfall in relation to sulfide concentration in a mangrove swamp" (Laurent, Le Bris, Gaill, & Gros, 2013) whose objective was to provide information on the temporal dynamics of wood eukaryote colonization from a shallow water experiment in a mangrove swamp. This experiment was carried out in order to know the state of the ecosystems present in these water bodies through chemical monitoring supported by different microscopic techniques, it was possible to determine the succession of colonizers in the mangrove is related to the rapid evolution of the sulfide concentration on the surface of the wood. In the research entitled "Mechanism of action and inhibitory activity of lupinifolin biofilm against clinical isolates of multiresistant enterococci" (Sianglum, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang, Muang). (Sianglum, Muangngam, Joycharat, & Voravuthikunchai, 2019) whose objective was to investigate the antibacterial activity and action of lupinifolin against multidrug-resistant enterococci clinical isolates. The importance of handling SEM and TEM techniques for this type of research is that they allow observing both superficially and internally, what is the behavior of this type of bacteria that affect the health of humans, and what type of treatment is efficient to counteract their effects. This study suggested that lupinifolin is an essential antimicrobial agent that could be useful for the treatment of multidrug-resistant enterococci infections.

5. Conclusions

This review article concludes by highlighting the importance of knowing the updated state of the literature published in databases such as Scopus or Wos, concerning the study of the use of Scanning Electron Microscopic Techniques (SEM) and Transmission (TEM) and their application in different areas of knowledge, This represents the generation of new theories from the analysis of the experience in different experiments proposed for the study of microscopic components in different samples and how such analysis can generate solutions to problems ranging from ecosystem care through the monitoring of environmental conditions, health care through the design of treatments to counteract the effects caused by pathogens, among others. In this way, the importance of knowing the impact of the research associated with the study of the variables mentioned above is highlighted, so it is expected that through the execution of research such as the one proposed in this document, the scientific community will be encouraged to develop new research projects that strengthen theories in view of the scarce bibliography found in the Scopus and Wos registries.

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