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Evaluation of the Use of Mountain Microorganisms on the Yield of Peanut (Arachis hypogaea L.) Crop

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Abstract

To develop this article, a documentary review of the elaboration and production of research works related to the study of Peanut (Arachis hypogaea L) and its yield from the Use of Mountain Microorganisms was carried out in order to know through a bibliometric study of the main characteristics of 604 publications registered in Scopus database during the period 2018-2022. The results yielded by such a database were organized in figures and tables, categorizing the information by variables such as Year of Publication, Country of Origin and Area of Knowledge which allowed to identify, through qualitative analysis, the position of different authors in front of the proposed thematic. The main findings of this research were that China stood out for having the highest scientific production, leading the list with 276 publications. Likewise, the area of knowledge that made the greatest contribution to the construction of bibliographic material related to the study of variables was agricultural and biological sciences, with 393 published documents.

Keywords: *Peanut, Peanut, Arachis Hypogaea L, Mountain microorganisms, Growth, Production.*

1. Introduction

The cultivation of peanuts, like any other crop, represents the satisfaction of the economic and nutritional needs of the places where these plantations are produced. However, it should be noted that, unlike other products, the peanut has become extensive worldwide since it can be used in livestock, agriculture, and as an input for the pharmaceutical industry, making it an important plant even for soil conservation. Its most popular species is Arachis Hypogaea L, the subject of multiple studies that seek to discover the best fertilizer option to guarantee the growth and continuous production of this leguminous plant.

According to Julio Montero (2020):

Important for human food and nutrition in developing countries. It is produced approximately 42.63 million tons per year worldwide and is the fourth most important source of edible vegetable oil worldwide. The main producers and exporters in the world

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are India, the United States and South America, Argentina, Brazil and Bolivia, which ranks 20th among 125 countries (Montero Torres, 2020)

Hence, producers and growers are trying to use the well-known Mountain Microorganisms, defined as “an economic biofertilizer, which contributes to improving the physical and chemical properties of the soil” (Secretary of Agriculture and Rural Development, n.d.). It is for this reason that this research article seeks to describe the main characteristics of the set of publications attached to the Scopus database that is directly related to the variables mentioned above, as well as the description of the position of specific authors affiliated with institutions around the world, during the period between 2018 and 2022.

2. General Objective

To analyze from a bibliometric and bibliographic perspective, the development of works on Peanut (Arachis hypogaea L.) Crop variables and its yield from the Use of Mountain Microorganisms during the period 2018-2022.

3. Methodology

This article uses a mixed research approach combining quantitative and qualitative methods.

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 Peanuts (Arachis hypogaea L.) and its yield from the Use of Mountain Microorganisms.

On the other hand, from a qualitative perspective, examples of some research works published in the area of the study mentioned above are analyzed from a bibliographic approach that allows describing the position of different authors on the proposed topic.

It is important to note that the entire search was conducted through Scopus, establishing the parameters referenced in Figure 1.

3.1 Methodological design

Figure 1. Methodological design

Source: Own elaboration

3.1.1 Phase 1: Data Collection

The data collection was executed from the Search tool on the Scopus web page, where 604 publications were obtained from the choice of the following filters:

the AND peanut AND crop AND arachis AND hypogaea AND l AND PUBYEAR > 2017 AND PUBYEAR < 2023 AND (LIMIT-TO (EXACTKEYWORD ,"Arachis Hypogaea")))

- Published papers whose study variables are related to the study of peanut (Arachis hypogaea L.) and its yield from the use of mountain microorganisms.
- Limited to keyword Arachis Hypogaea.
- Limited to the years 2018-2022.
- No country limitation.
- No limit in areas of knowledge.
- Without distinction of type of publication.

3.1.2 Phase 2: Construction of analysis material

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

- Word co-occurrence.
- Year of publication.
- Country of origin of the publication.
- Knowledge area.
- Type of Publication.

3.1.3 Phase 3: Drafting conclusions and final document

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

4. Results

4.1 Co-occurrence of words

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

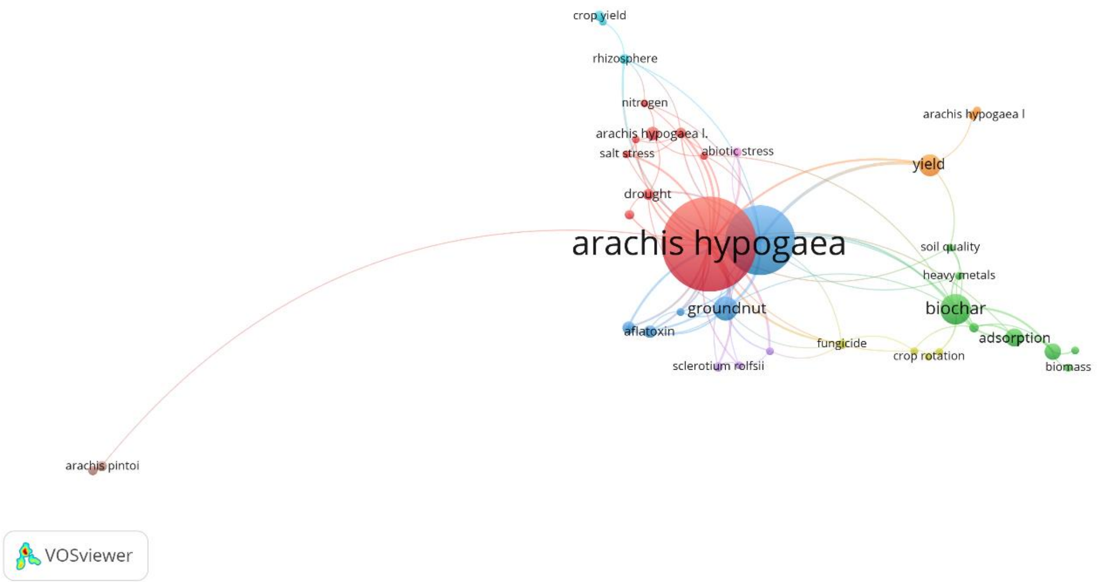

Figure 2. Co-occurrence of words

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

The data in Figure 2, exported from Scopus, shows the variables and their relationship with other terms, which are explained below.

The Arachis Hypogaea species is one of the most representative legumes found in peanuts throughout the world, thanks to the fact that due to its characteristics, it has achieved higher crop yields through nitrogen fixation in the soil. Since it has long been known about the relationship of this type of crops with the improvement of the soil conditions where they are found, farmers choose to rotate crops from time to time, alternating the production of legumes and other types of planting that allow the maintenance of the land in good condition.

4.2 Distribution of scientific production by year of publication

Figure 3 shows the distribution of scientific production according to the year of publication.

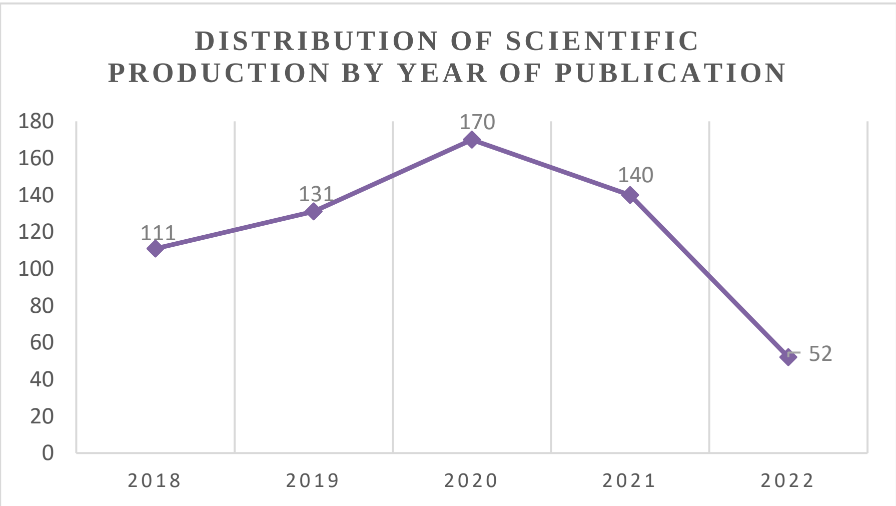

Figure 3. Distribution of scientific production by year of publication.

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

Figure 3 shows the scientific production concerning the variables Peanut Crop (Arachis hypogaea L.) and its yield from the Use of Mountain Microorganisms in the period from 2018 to 2022, which resulted in the publication of 604 documents in the Scopus database, containing the keywords. Likewise, throughout the period, several changes were experienced. The year 2018 with 11 documents, a number that varies during the following years. During 2019, 131 texts were published, while in 2020, 170 publications were reached. In 2021, the reduction in the publication figure began, achieving the publication of only 140 documents during that year. However, the lowest number of documents was obtained in 2022, when only 52 were published.

From the year 2022, the article entitled “Host specificity and symbiotic association between autochthonous strain of Rhizobium and Arachis hypogaea plant” stands out (Pindi & K., 2022), in which the aim was to “improve nodulation and plant growth” (Pindi & K., 2022) through the use of rhizobial isolates such as Bradyrhizobium yumangenesis sps. AB5 (NCBI accession no.: ON724398), B. japonicum BD5 (ON724369), B. elkanii KT5 (ON729445), B. arachidis ET5 (ON729963), B. liaongense JN5 (ON734019) and B. elkanii NP5 (ON734425). With this method, it could be demonstrated that “Amrabad strains are very specific for the host of Arachis hypogaea plants and, when inoculated, boosted plant nodulation and growth” and that the AB5 species can be used in any type of soil as it will result in Arachis hypogaea plant with better characteristics (Pindi & K., 2022).

4.3 Distribution of scientific production by country of origin.

Figure 4 shows the distribution of scientific production according to the nationality of the authors.

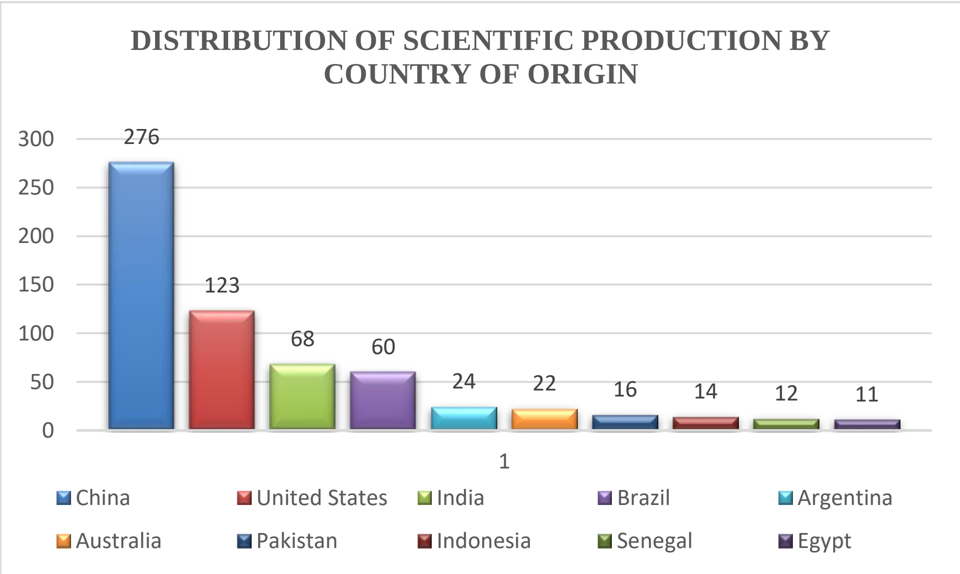

Figure 4. Distribution of scientific production by country of origin.

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

In the study of peanut (Arachis hypogaea L.) crop and its yield from the use of mountain microorganisms, China leads the list of published papers with a total of 276 records in the Scopus database during the period of the years 2018-2022, followed by the United States and India with 123 and 68 texts each.

The review “Genetic transformation of Arachis hypogaea using novel genes conferring fungal resistance: a review” (Chowdhury et al., 2022) states that peanut production depends on several types of stresses, among which are fungi, which can affect production and "are hazardous to health for both human consumption and poultry" (Chowdhury et al., 2022). This review epitomizes the total scenario from the plant physiological basis of fungal diseases to peanut development approaches, which aims to develop a concrete understanding of sustainable management of peanut production. Furthermore, this study provides comprehensive information on the development of fungus-resistant peanuts so that further research in this field can be guided in an integrated manner, boosting sustainable improvisation in peanut cultivation.

At this point, it is important to note that the elaboration of scientific publications, in many cases, is based on collaborations that may involve private and public institutions from one or several countries. Therefore, the same publication may be linked to one or more authors with different nationalities and thus to more than one country simultaneously, making part of each of the total number of articles or publications in the final sum. Figure 5 shows the flow of collaborative work carried out by several countries in greater detail.

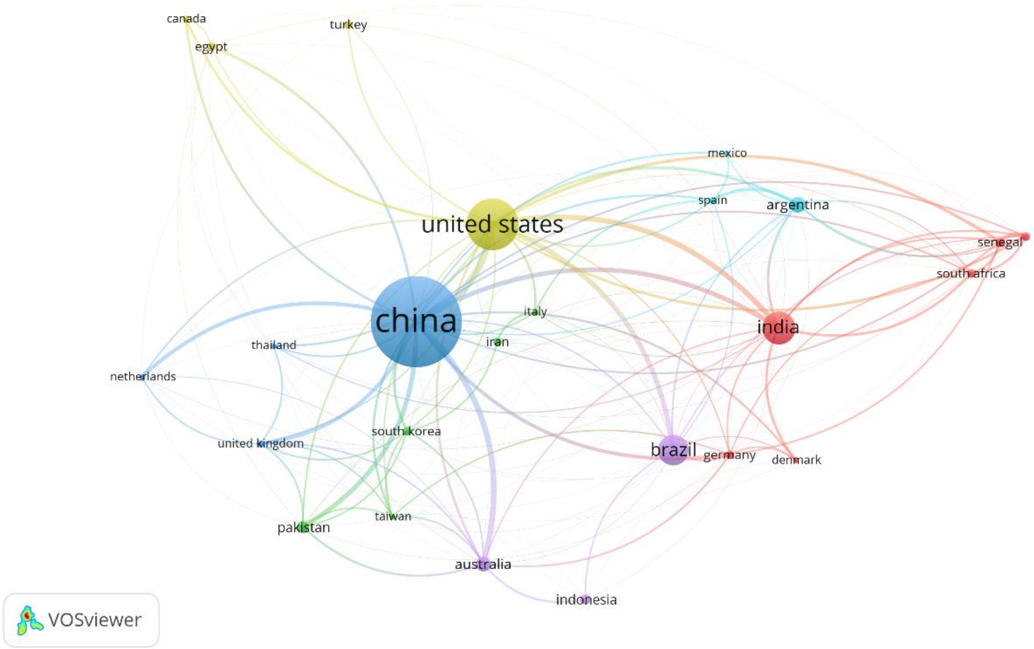

Figure 5. Co-citations between countries.

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

Figure 5 shows the research grouping according to the collaboration between authors from different international institutions. Again, outstanding participation is evidenced among authors affiliated with institutions in countries such as China, the United States, Australia, Brazil, India, Mexico, and Argentina, among others.

4.4 Distribution of scientific production by area of knowledge

Figure 6 shows the distribution of the production of scientific publications according to the area of knowledge through which the different research methodologies are implemented.

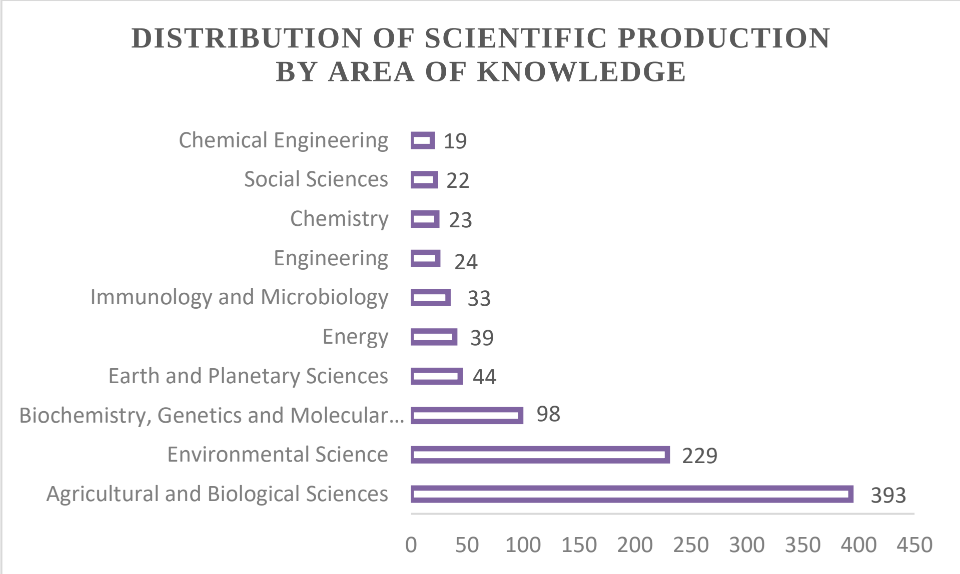

Figure 6. Distribution of scientific production by area of knowledge.

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

Due to the nature of the variables, it is not surprising that most of the publications found in the Scopus database on these variables are from the agricultural and biological sciences, occupying the leading position in the publication of documents. However, other areas such as environmental science and biochemistry, genetics and molecular biology have contributed to the study of these variables, publishing 229 and 98 documents each.

As shown in Figure 6, the variables object of this study is relevant in several areas of knowledge, since the management of crops, in this case, peanuts, involves many farmers who actively contribute to the economy and the consumption chain of a territory. For this reason, everything related to the production of their crops must be regulated so that their development is carried out in the best possible way without affecting the final consumer.

4.5 Type of publication

The following figure shows the distribution of the bibliographic findings according to the type of publication made by each of the authors found in Scopus.

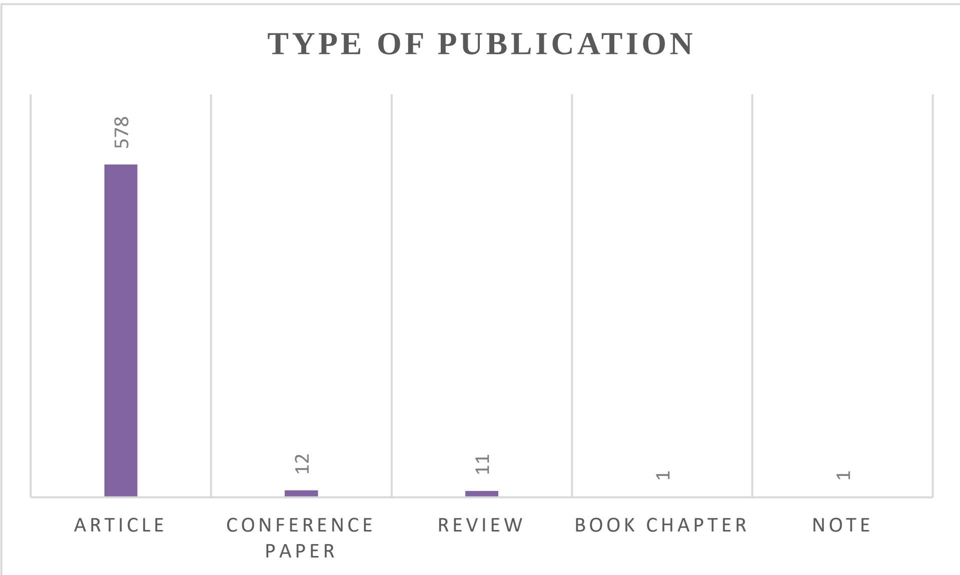

Figure 7. Type of publication.

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

Figure 7 clearly shows that the predominant type of publication in the study of peanut (Arachis hypogaea L.) cultivation and its yield from mountain microorganisms was the journal article with a total of 578 documents. In second place were conference proceedings with 12 papers and reviews with 11 publications.

The article entitled “A protocol for the generation of Arachis hypogaea composite plants: A valuable tool for the functional study of mycorrhizal symbiosis” (Arthikala et al., 2022) discusses the use of “hairy root systems is a rapid and convenient alternative to study root biology, biotic and abiotic stresses, and root symbiosis in recalcitrant legume species in vitro such as Arachis hypogaea” (Arthikala et al., 2022) whose effectiveness is shown through the use of an enhanced green fluorescent protein (eGFP) expression vector and an auxin-sensitive DR5 marker fused to β-glucuronidase (GUS). Concluding that through their analysis, they developed a rapid, efficient and cost-effective composite plant protocol for A. hypogaea that is particularly effective for root-related studies and validating candidate genes in A. hypogaea during mycorrhizal symbiosis.

5. Conclusions

After the bibliometric analysis executed in the present research work, it could be established that China was the country with the highest number of published records facing the variables Peanut (Arachis hypogaea L.) Cultivation and its yield from the Use of Mountain Microorganisms with a total of 276 publications in the Scopus database during the period 2018-2022 and the area of knowledge with the highest contribution was agricultural and biological sciences with 393 texts.

All the tests carried out, and methods used for the conservation of peanut Arachis hypogaea L showed that this type of plant can adapt to different types of soil even though it was not suitable for planting at the beginning. Something that could be due to the power of nitrogen fixation through the symbiotic process between the plant and certain types of bacteria or fungi that are beneficial for the increase in peanut production, so we can say that the use of mountain microorganisms has been of great help in increasing the production of Arachis Hypogaea in the world.

Likewise, another relevant factor to take into account is that the implementation of fertilizers and fungicides of natural origin that do not put at risk access to this great product, considered a great source of protein, can be considered less risky for the health of the final consumers, which is why it is considered necessary in the food safety plans of many countries that are dedicated to its cultivation.

On the other hand, the most common diseases of peanuts in the Northwest Line are rust, brown leaf spot, black leaf spot, and legume rot. In multiple bibliography documents, mention was made of several strategies created and tested in peanut crops, achieving excellent results in eradicating diseases and recovering infected plantations.

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