

Dynamics of scientific production on Acrididae (Orthoptera) in Brazil: A bibliometric analysis of themes and impact

Dinâmica da produção científica sobre Acrididae (Orthoptera) no Brasil: Uma análise bibliométrica de temas e impacto

Dinámica de la producción científica sobre Acrididae (Orthoptera) en Brasil: Un análisis bibliométrico de temas e impacto

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Abstract

This study presents a bibliometric analysis of scientific production on grasshoppers of the Acrididae family in Brazil, aiming to identify patterns of publication, academic impact, collaboration networks, and thematic structure. Data were collected from the Web of Science and Scopus databases, covering the period from 1979 to 2025. The analysis was conducted using R software, with the Bibliometrix and Biblioshiny packages. Thematic maps reveal a predominance of basic taxonomic and ecological studies, with emerging niches in molecular genetics and aquatic ecology. The keyword co-occurrence network highlights thematic fragmentation in the field, with two major clusters: one focused on taxonomy and biogeography, and another on the ecology of wet environments. The conceptual structure map and dendrogram reinforce this division, pointing to the need for greater interdisciplinary integration. It is concluded that research on Acrididae in Brazil has solid foundations but requires thematic renewal, methodological diversification, and expansion of international collaborations.

Keywords: Acrididae; Bibliometrics; Scientific production.

Resumo

Este estudo apresenta uma análise bibliométrica da produção científica sobre gafanhotos da família Acrididae no Brasil, com o objetivo de identificar padrões de publicação, impacto acadêmico, redes de colaboração e estrutura temática. Os dados foram coletados das bases Web of Science e Scopus, abrangendo o período de 1979 a 2025. A análise foi realizada utilizando o software R, com os pacotes Bibliometrix e Biblioshiny. Os mapas temáticos revelam predominância de estudos básicos taxonômicos e ecológicos, com nichos emergentes em genética molecular e ecologia aquática. A rede de coocorrência de palavras-chave evidencia fragmentação temática na área, com dois grandes agrupamentos: um focado em taxonomia e biogeografia, e outro na ecologia de ambientes úmidos. O mapa de estrutura conceitual e o dendrograma reforçam essa divisão, apontando para a necessidade de maior integração interdisciplinar. Conclui-se que a pesquisa sobre Acrididae no Brasil possui bases sólidas, mas requer renovação temática, diversificação metodológica e expansão das colaborações internacionais.

Palavras-chave: Acrididae; Bibliometria; Produção científica.

Resumen

Este estudio presenta un análisis bibliométrico de la producción científica sobre saltamontes de la familia Acrididae en Brasil, con el objetivo de identificar patrones de publicación, impacto académico, redes de colaboración y estructura temática. Los datos fueron recopilados de las bases Web of Science y Scopus, cubriendo el período de 1979 a 2025. El análisis se realizó utilizando el software R, con los paquetes Bibliometrix y Biblioshiny. Los resultados indican una producción científica irregular, con picos ocasionales y sin una tendencia de crecimiento consistente. Los

mapas temáticos revelan una predominancia de estudios básicos taxonómicos y ecológicos, con nichos emergentes en genética molecular y ecología acuática. La red de coocurrencia de palabras clave evidencia una fragmentación temática en el campo, con dos grandes agrupamientos: uno centrado en taxonomía y biogeografía, y otro en la ecología de ambientes húmedos. El mapa de estructura conceptual y el dendrograma refuerzan esta división, señalando la necesidad de una mayor integración interdisciplinaria. Se concluye que la investigación sobre Acrididae en Brasil tiene bases sólidas, pero requiere renovación temática, diversificación metodológica y expansión de las colaboraciones internacionales.

Palabras clave: Acrididae; Bibliometría; Producción científica.

1. Introduction

The order Orthoptera constitutes one of the most diverse groups within Polyneoptera, currently comprising more than 29,000 described species (Cigliano et al., 2022). It is a cosmopolitan taxon, widely distributed in tropical and subtropical regions, with occurrences also in areas of high altitude and latitude. Its populations tend to present high density, which makes orthopterans relevant components of terrestrial fauna, both in ecological and economic terms (Bidau, 2014; Santos Junior et al., 2021; Souza-Dias, 2024).

In the Neotropical region—considered one of the most biodiverse on the planet—more than 6,497 species of Orthoptera had been recorded by 2022, representing just over 20% of the known global diversity (Cigliano et al., 2022; Castro-Souza et al., 2025). However, this number is underestimated due to the scarcity of systematic studies and the lack of specialists dedicated to the order in the region. While countries such as Argentina, Brazil, and Uruguay have a tradition in orthopterological research, vast continental areas remain practically unexplored, such as Bolivia, Guyana, Suriname, and Venezuela (Carbonell, Cigliano, & Lange, 2006).

In Brazil, a total of 1,952 species had been recorded by 2022, distributed across 565 genera and 18 families, corresponding to about 30% of the known Neotropical diversity (Cigliano et al., 2022). The Brazilian fauna of Caelifera is relatively well documented, with 924 species recorded. For Ensifera, 1,028 species are known—a slightly higher number, but still insufficient to reflect the true diversity of the suborder. Historically, several foreign orthopterists carried out expeditions in the national territory and contributed significantly to the knowledge of grasshopper (Caelifera) fauna.

This study presents a bibliometric analysis of scientific production on grasshoppers of the Acrididae family in Brazil, aiming to identify patterns of publication, academic impact, collaboration networks, and thematic structure and existing gaps in the literature. By systematizing and visualizing these data, the study intends to contribute to strengthening orthopterological research in Brazil, highlighting priority areas for investigation and the need for training specialists in the taxonomy and ecology of Acrididae.

2. Methodology

2.1 Data collection

This study is characterized as a bibliometric research (Ferreira & Vidigal, 2025) of a quantitative and exploratory nature (Pereira et al., 2018), employing simple descriptive statistics with data classes and absolute frequency in quantity (Shitsuka et al., 2014), the use of time series (Nascimento et al., 2015), and statistical analysis (Costa Neto & Bekman, 2009), in a study focused on analyzing the scientific production on the Acrididae family. Bibliographic data were obtained through searches in the Scopus (Elsevier) and Web of Science databases, recognized for their comprehensiveness and reliability in indexing scientific literature.

The search was conducted in August 2025, using the following descriptors in the title, abstract, and keyword fields: “Acrididae AND Brasil.”

Documents included were scientific articles, reviews, book chapters, and conference communications, published up to the year 2025, in any language. Duplicate records or those that mentioned the group only marginally were excluded. Records were exported in .bib format, with the “full record” field activated, ensuring the retrieval of detailed metadata (title, authors, keywords, institutional affiliation, source, references, etc.).

2.2 Data processing and treatment

The analysis was conducted in R software (R Core Team, 2025), using the bibliometrix package (Aria & Cuccurullo, 2017). Files were converted into bibliometric analysis format through the function `convert2df()`, with parameters `dbsource = "scopus"` and `format = "csv"` or `bib`, depending on the database used.

Data underwent cleaning procedures, such as standardization of author names, normalization of keywords, and removal of duplicates. Multivariate analyses were performed based on relative frequency, term co-occurrence, and conceptual clustering.

2.3 Bibliometric analyses

The general analysis was performed using the function `biblioAnalysis()`, which provides descriptive statistics such as: Annual production of documents; Most relevant sources; Most frequent keywords; Average citations per document; Institutional and international collaborations.

3. Results and Discussion

The bibliometric analysis conducted on the scientific production involving grasshoppers of the family Acrididae in Brazil covers a period of 46 years, between 1979 and 2025. During this interval, 73 documents were identified, published across 36 different sources, reflecting a relatively modest scientific output distributed over time

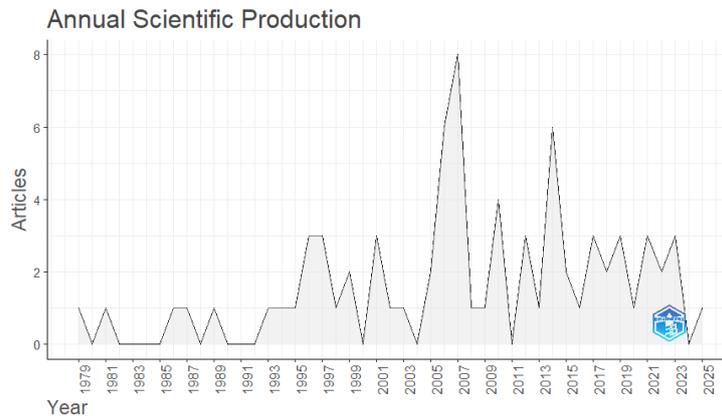
3.1 Temporal evolution of scientific production

Scientific production on this group in Brazil shows a trajectory marked by significant fluctuations over time. The annual publication graph (Figure 1) reveals that output was modest and sporadic, with at most one article per year. From the second half of the 1990s onward, there is a gradual increase in publication frequency, with notable peaks in 2005 and 2014, each recording five publications. The year 2007 stands out as the period with the highest number of articles published in a single year (seven documents), representing an isolated peak of productivity.

This constant oscillation indicates that research on Acrididae did not follow a continuous growth pattern, but rather a dynamic influenced by factors such as research funding and institutional restructuring. Despite these variations, a moderate growth trend can be observed across the decades, especially when compared to the near absence of production in the early years analyzed. In more recent years (2020–2025), a modest resurgence is evident, possibly driven by current environmental and agricultural concerns.

The absence of a clear growth trend, reinforced by the annual growth rate of 0%, suggests that the field remains scientifically stable but still underexplored. This opens space for new approaches, particularly in areas such as functional diversity, ecological bioindicators, and the role of Acrididae in environmental restoration.

Figure 1. Annual scientific production on Acrididae in Brazil (1979–2025).



Source: Research data (2025).

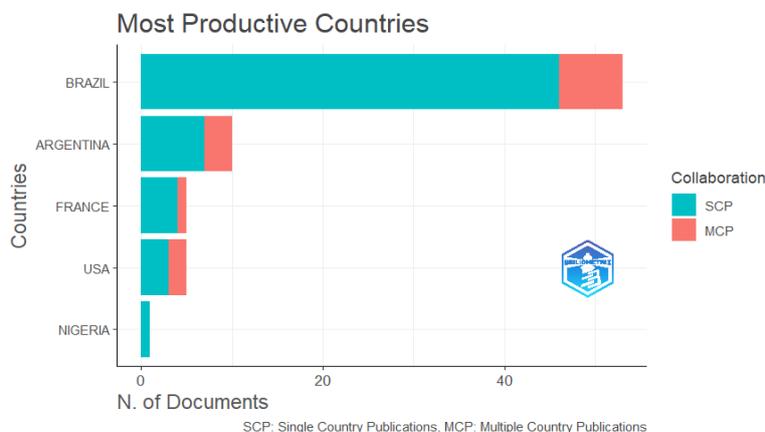
Complementarily, the analysis also allowed the observation of the geographical distribution of scientific production on Acrididae, as presented in Figure 2. Brazil stands out prominently, with more than 30 published documents, consolidating its leadership in research on this insect family. This prominence reflects not only the richness of local biodiversity but also the consistent work of specialized research groups.

Most Brazilian publications are classified as SCP (Single Country Publications), indicating the predominance of studies conducted exclusively by national institutions. However, there is also a relevant presence of MCP (Multiple Country Publications), evidencing a growing international collaboration by Brazilian researchers.

Other countries, such as Argentina, Benin, France, and Germany, showed more modest production, generally linked to internationally co-authored publications (MCP). This suggests the existence of collaborative networks with Brazilian or other foreign researchers, contributing to the global circulation of knowledge.

Although global production is still concentrated in a few countries, the data reveal a growing collaborative effort, especially in nations with a lower volume of publications. International collaboration plays a strategic role in expanding the impact and diversity of research, as well as contributing to the strengthening of science on a global scale.

Figure 2. Most productive countries in publications on Acrididae.



Source: Research data (2025).

3.2 Average citations per year

The analysis of the average number of citations per year reveals a significant variation in the impact of articles on Acrididae over time. It shows that, although scientific production has been irregular, certain periods attracted greater attention

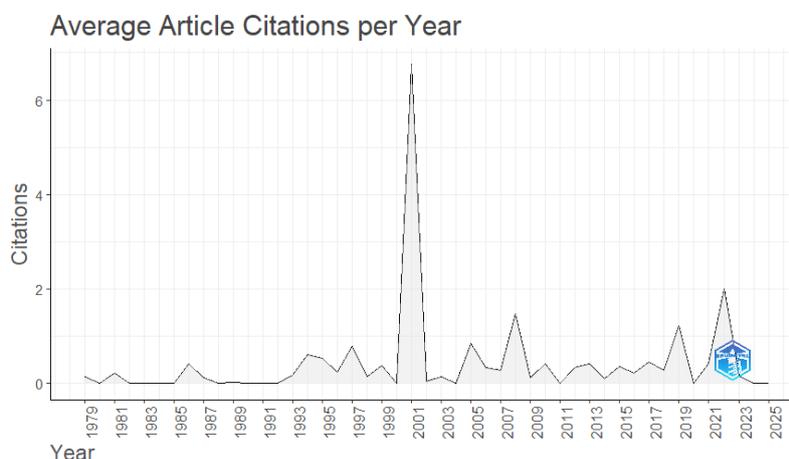
from the academic community, reflected in citation peaks (Figure 3).

The early 2000s stand out, particularly around the year 2000, when the average number of citations exceeded six per article, indicating that the works published during this period were widely referenced. This peak may be related to the publication of landmark studies or the intensification of applied research, such as agricultural pest control, which gained relevance at that time.

In subsequent years, fluctuations in the average number of citations can be observed, with periods of lower impact interspersed with small increases. This oscillation may reflect both the episodic nature of research on Acrididae - often motivated by specific outbreaks—and the lack of thematic continuity in certain lines of investigation.

The continued citation of older articles contributes to the relatively high average age of documents (17.1 years), suggesting that part of the literature remains relevant, but also indicating the need for scientific renewal, with new studies that engage with contemporary approaches such as functional diversity, ecological bioindicators, and restoration ecology.

Figure 3. Annual citations on Acrididae in Brazil (1979–2025).



Source: Research data (2025).

This pattern is expected in scientometric studies, since more recent articles have not yet had sufficient time to accumulate significant citations. In addition, the impact of the COVID-19 pandemic, which began in 2020, may have influenced both the production and citation of studies during this period.

This pattern may reflect a need for thematic renewal, greater articulation among researchers, and the adoption of new methodological approaches capable of rekindling the scientific community's interest in this group of insects.

3.3 Most relevant sources in Acrididae research

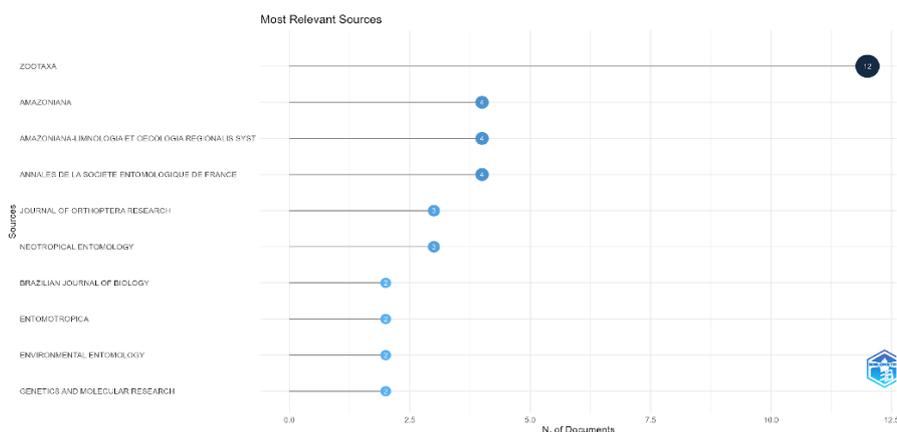
The analysis of the most relevant sources reveals that scientific production on Acrididae in Brazil is concentrated in a relatively small set of specialized journals. The absolute highlight is the journal *Zootaxa*, which gathers 12 documents, representing a significant portion of the literature on the group. This predominance suggests that *Zootaxa* serves as a central platform for taxonomic and systematic publications related to acridid grasshoppers.

Other journals with a balanced presence include *Amazoniana*, *Annales de la Société Entomologique de France*, *Journal of Orthoptera Research*, *Neotropical Entomology*, and *Amazoniana–Limnologia et Geologia Regionalis Syst*, each with three documents. These sources indicate a diversity of approaches, ranging from regional studies in the Amazon to broader entomological investigations.

In addition, journals such as Brazilian Journal of Biology, Entomotropica, Environmental Entomology, and Genetics and Molecular Research appear with two documents each (Figure 4), reflecting specific contributions in areas such as ecology, genetics, and pest control.

This distribution shows that, although specialized journals concentrate most of the production, there is also thematic dispersion that allows publication in multidisciplinary journals. This can be strategically explored by researchers seeking to broaden the reach of their studies, especially when integrating ecological, functional, or applied aspects of Acrididae biology.

Figure 4. Most frequently used sources on the topic in Brazil.



Source: Research data (2025).

3.4 Thematic map of keywords: Relevance and development

The thematic map (Figure 5) presented classifies the main topics of research on acrididae based on two axes: centrality (degree of relevance to the scientific field) and density (degree of internal development of the theme). This approach makes it possible to identify four quadrants, each representing a distinct thematic category:

Motor Themes (High centrality and high density)

Located in the upper right quadrant, topics such as “acrididae,” “grasshopper,” and “orthoptera” are considered research drivers. They are widely connected with other topics and well developed methodologically. They represent the consolidated core of the literature, sustaining the conceptual and taxonomic foundation of the field.

Basic Themes (High centrality, low density)

In the lower right quadrant appear terms such as “taxonomy,” “morphology,” “state,” and “desert locust.” These are fundamental and widely used themes, but they still lack technical or methodological depth. These topics are essential to the structure of research but offer potential for expansion and sophistication.

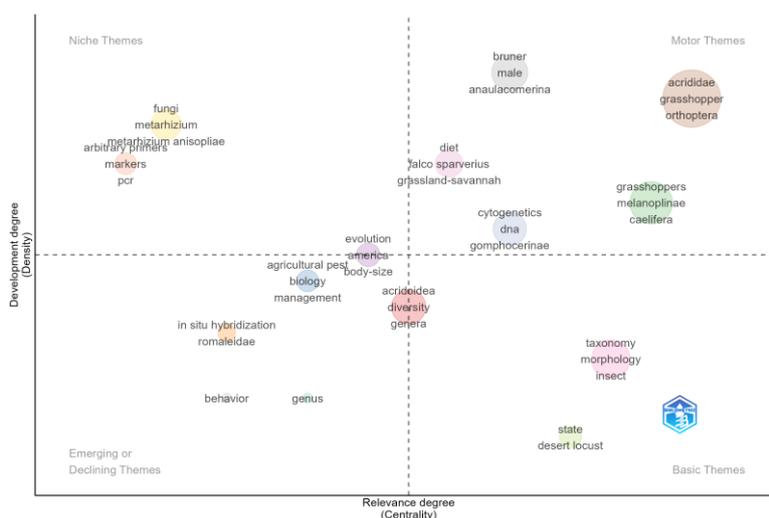
Niche Themes (High density, low centrality)

In the upper left quadrant are words such as “fungi,” “metarhizium,” “primers,” and “PCR.” These themes are highly specialized and well developed internally, but with little connection to the rest of the literature. They represent technical niches, generally linked to specific applications such as biological control or molecular genetics.

Emerging or Declining Themes (Low centrality and low density)

In the lower left quadrant are terms such as “behavior,” “genius,” and “in situ hybridization.” These topics may be either emerging or declining, depending on the context. They represent areas with little articulation and development, but which may indicate opportunities for innovation or critical reviews.

Figure 5. Thematic map of keywords.



Source: Research data (2025).

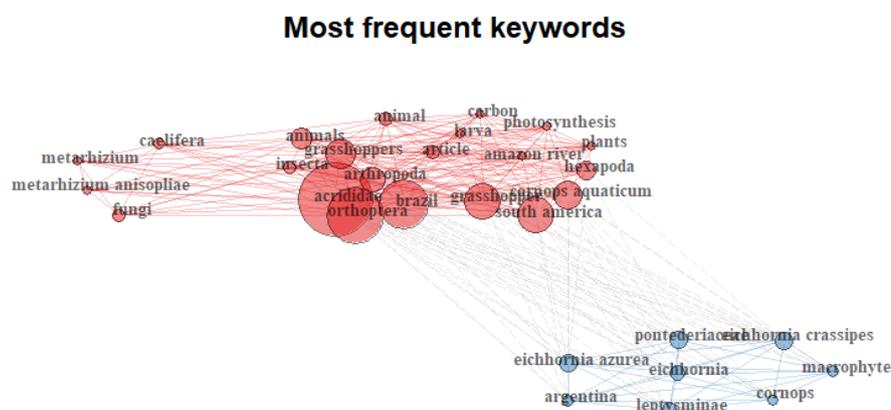
The keyword co-occurrence network highlights the semantic structure of scientific production on Acrididae, revealing how the main concepts cluster and interact within the literature. The nodes represent keywords, and their size indicates frequency of use, while the connections (edges) show which terms most frequently appear together.

The visualization reveals two distinct thematic clusters, suggesting conceptual fragmentation: The red cluster, located on the left, groups terms such as “orthoptera,” “acrididae,” “grasshopper,” “insect,” “animal,” and “south america.” This core represents the taxonomic and ecological basis of the research, focusing on biological classification, geographic distribution, and general aspects of Acrididae biology. The blue cluster, on the right, brings together terms such as “pontederiaceae,” “eichhornia crassipes,” “eichhornia azurea,” “macrophyte,” and “argentina.” This group is associated with applied ecological studies, particularly in aquatic environments and interactions between grasshoppers and host or invasive plants.

The separation between clusters indicates that there are thematic subareas with limited connections, which may reflect excessive specialization or a lack of dialogue between research lines. This fragmentation restricts the development of integrative approaches, such as the use of Acrididae as bioindicators in aquatic ecosystems or studies on cross-ecological impacts between fauna and flora. Moreover, the presence of geographic terms such as “south america” and “argentina” reinforces the regional scope of the research, while also pointing to potential for international collaboration, especially in comparative studies among South American countries (Figure 6).

This co-occurrence network is strategic for identifying conceptual gaps, guiding new interdisciplinary investigations, and strengthening the thematic coherence of scientific production on Acrididae in Brazil.

Figure 6. Co-occurrence network of the most frequent keywords in articles on Acrididae in Brazil. The nodes represent keywords, and their size indicates frequency. The colors identify distinct thematic clusters: biology/physiology (blue) and taxonomy/geography (red).



Source: Research data (2025).

3.5 Structural analysis of concepts and thematic clusters

Complementing the hierarchical analysis, the conceptual structure map (WCA) positions the main terms of the literature in a two-dimensional space, based on principal components that explain thematic variance. The axes represent latent dimensions that organize the concepts according to their frequency and co-occurrence.

The terms are distributed into visual clusters, and a red polygon highlights a dominant conceptual cluster, which includes words such as “america,” “organization,” “floodplains,” “chromosome,” “fungi,” “animals,” and “water-hyacinth.” This grouping suggests an intersection between ecological, genetic, and geographic themes, indicating that a significant portion of scientific production is focused on the interaction between organisms and environments, with emphasis on morphological and genetic aspects, as shown in Figure 7.

The dispersion of other terms outside the polygon indicates the existence of peripheral or emerging concepts that have not yet consolidated as thematic nuclei. This configuration reinforces the need for greater articulation among subthemes and points to opportunities for interdisciplinary integration, particularly between ecology, genetics, and conservation.

agriculture. Thus, the systematic application of bibliometrics becomes essential to optimize resources, foster international collaborations, and ensure that scientific advances are directed toward current environmental and socioeconomic demands.

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