Bibliometric Analysis of Scientific Production Related to Tick Control

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Abstract

Ticks are distributed all over the world and significantly affect human and animal health. Increasing public health concern with tick-borne diseases requires the strategic control of ticks in animals that transmit diseases to humans. The aim of this article is to present a bibliometric analysis of the scientific production related to tick control, using bibliometrics as an instrument of analysis to measure scientific activity. To identify the studies, a search was made on four Scopus databases, Web of Science, Medline / Pubmed and Science Direct. Of 1764 publications, only 480 were analyzed after the exclusion of certain productions according to previously defined criteria. It was pointed out that the identified studies have great relevance for the control of ticks, considering that scientific publications are important markers of the activity of production and development of the field of knowledge.

Keywords: Ticks; control; bibliometrics; publications; scientific production; bibliometric analysis.

1. Introduction

Ticks parasite a wide range of hosts and have different lifestyles from one species to another. In the world there are more than 800 species of ticks that have already been identified (Péter; Brossard, 1998). All species require obligatorily vertebrate blood and have a significant degree of specificity and can use alternative hosts, including man (Massard; Fonseca, 2004).

Controlling these parasites and ectoparasite diseases they transmit is extremely difficult. Currently, control of pet infestations is mainly based on acaricides in the form of baths, sprays, shampoo, collars and etc ... (Péter & Brossard, 1998). However, ticks and tick-borne diseases continue to be a major concern (Bowman; Nuttall, 2004).

Given this assumption, it is fundamental to leverage information on the subject by promoting and disseminating the intellectual structure of its scientific productions related to tick control, through a bibliometric analysis of publications in the area. Bibliometric analysis can be used to provide real and concrete data on trends and priorities around the world. In addition to assessing newspaper quality, mapping global trends in research productivity and quality, and evaluating interdisciplinary alliances (Bliziotis et al., 2005; Soteriades et al., 2005).

This article aimed to evaluate the scientific publications related to tick control in order to identify the characteristics of the work, such as authors contributing to the theme, period of publications, countries, periodicals in which the works are published, among others. For this, bibliometric techniques were used, which employ quantitative methods in the search for an objective evaluation of scientific production.

2. Theoretical Review

The ticks are arthropods of the class Arachnida, order Acari and families Ixodidae and Argasidae considered of economic importance and for public health. All species require blood supply of vertebrates to complete their development and have a significant degree of specificity and can use alternative hosts, including man (Massard; Fonseca, 2004). Globally, ticks transmit a number of pathogenic organisms such as protozoa, rickettsiae, spirochetes and viruses, which are any other group of arthropod vectors, and are among the most important vectors of diseases affecting cattle, humans and pets. (Ghosha; Azhahianambia; Yadav, 2007). Ticks can also cause serious toxic conditions such as paralysis and toxicose, irritation and allergy (Jongejan; Uilenberg, 2004).

The control of ticks is largely based on the use of acaricidal drugs (Brito et al., 2006). It is extremely difficult to control ticks and the diseases they transmit. The indiscriminate use of these acaricides poses significant problems (emergence of resistant strains of ticks, pollution, cost, etc.). There is, therefore, a great interest in the development of alternative methods of control (Péter; Brossard, 1998). It is recommended to implement existing methods for vaccination against tick-borne diseases, as well as intensified research for the development of new vaccines against a variety of ticks and pathogens (Jongejan; Uilenberg, 2004).

Tick-borne diseases greatly affect human and animal health throughout the world, and vaccines are an ecological alternative to acaricides for their control (Contreras; De la Fluente, 2017).

3. Methodology

The methodological approach of this research is characterized as descriptive and exploratory, with a quantitative approach and makes use of bibliometric techniques. Bibliometry is a technique for measuring production indices and disseminating scientific knowledge (Fonseca, 1986). Its central point is the use of quantitative methods (Araújo, 2006) that make it possible to analyze the development of a field of science in order to identify its characteristics, such as: the chronological growth of scientific production; The productivity of journals, authors and institutions; Collaboration between researchers and institutions; The impact of publications; The analysis and evaluation of sources diffusing works and frequency of keywords (Bufrem ; Prates, 2005; Chan et al., 2007).

For the survey and research a bibliometric analysis was performed in the Scopus, Web of Science, Medline / Pubmed, Science Direct databases accessed from the Capes Journal Portal on March 20, 2017. The following term "tick And control "searched in the bases in the" title "field the number of documents retrieved in this search is presented in Table 1.

Table 1. Number of articles found in databases

Data base	Search Expression	Result
Scopus	"tick" and control	633
Web of Science	tick* and control	649
Medline/Pubmed	tick and control	344
Science Direct	"tick" and control	138
Total		1764

Source: Own elaboration based on data from the databases.

4. Analysis

After the bibliographic search in the databases, the identified documents were exported to Microsoft Excel, where the selection process began. As inclusion criterion, studies with a control method for ticks were considered. Studies with themes from other areas and that did not deal with tick control according to Figure 1 were excluded.

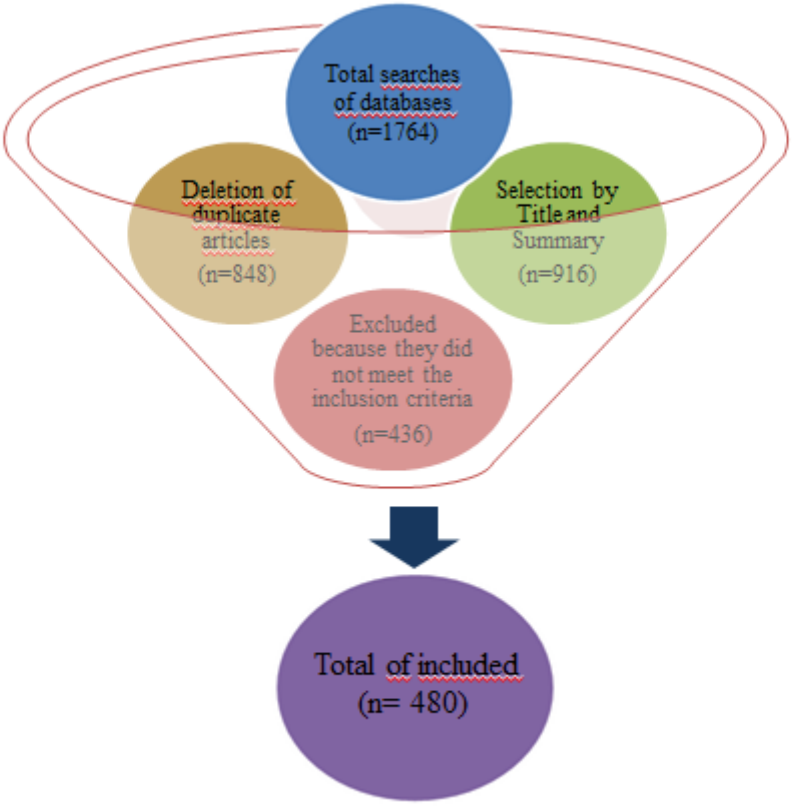

Figure1. Flowchart of the selection process - Source: Own elaboration.

4.1 Distribution of articles per year

Figure 2 shows the temporal distribution of the 480-identified works. It is noticed that, although the studies on the subject began in 1927, that is to say, 90 years ago, most of the publications represented

took place from 1992.

It is identified that the control theme for tick received more attention in the last 25 years.

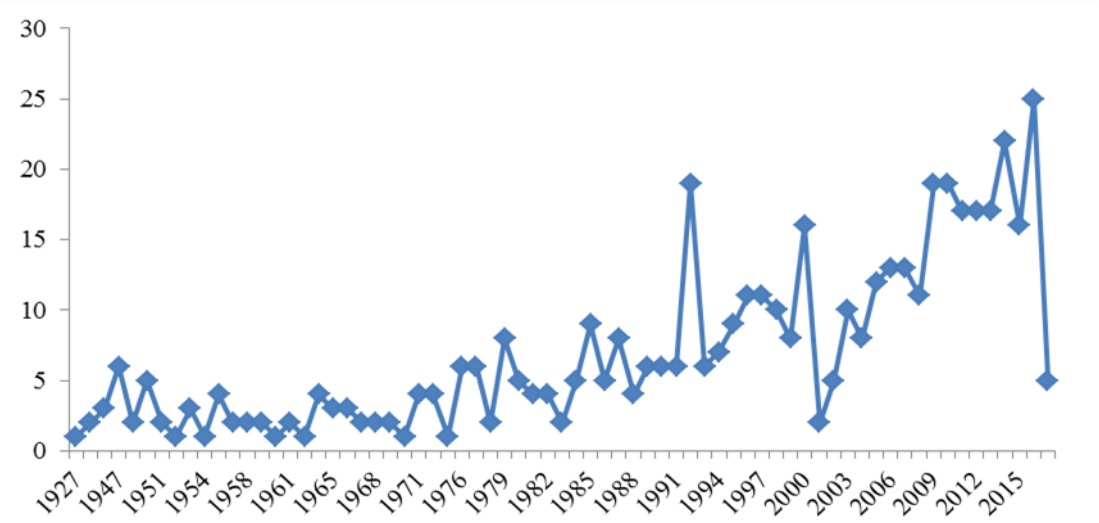

Figure 2. Distribution of articles per year - Source: Own elaboration.

4.1.1 Analysis of the journals with the highest frequency of publications

In the sequence, we analyzed the periodicals with the highest frequencies of published articles on the subject. Figure 3 presents the ten journals with the largest number of publications (10 articles or more), totaling 196 articles, representing 40.8% of the total number of articles. They stand out among the journals Veterinary Parasitology and Journal of Economic Entomology.

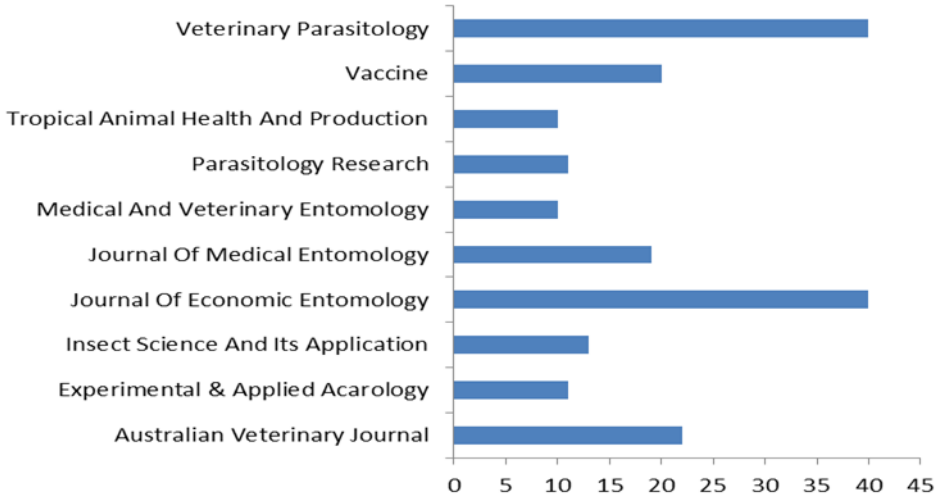

Figure 3. Periodicals with higher frequency of publications - Source: Own elaboration.

4.1.2 Most cited authors

From the citation counts received it was possible to obtain the most cited authors in the articles analyzed. We selected the 11 authors who had the highest number of citations. They are shown in Table 2.

Table 2. Most cited authors

Author	Number Quotations
GEORGE, John. E. (United States)	238
POUND, Joe Mathews (United States)	223
SAMISH, Michael (Israel)	158
DRUMMOND, Roger O. (United States)	102
SONENSHINE, Daniel E. (United States)	101
MILLER, John Allen (United States)	98
WHETSTONE, Thomas M. (United States)	83
ALLAN, Sandra A. (United States)	58
NORVAL, R. Andrew I. (United States)	58
GLANDNEY, William J. (United States)	55
BITTENCOURT, Vânia Rita Elias Pinheiro (Brazil)	54

Source: Own elaboration.

4.1.3 Coherence Density Diagram

VOSViewer is a free access computer program used to create maps based on network data, it was used to construct a co-authoring density diagram. The visualization of the collaborative research network (or network of co-authors) involving the most productive authors.

The intensity of the colors indicates the density of the authors, ranging from blue (lower density) to red (higher density). The closer the red color is to the die, the greater the degree of occurrence. We can see in Figure 4 that DE LA FUENTE J. is the author of higher co-authorship.

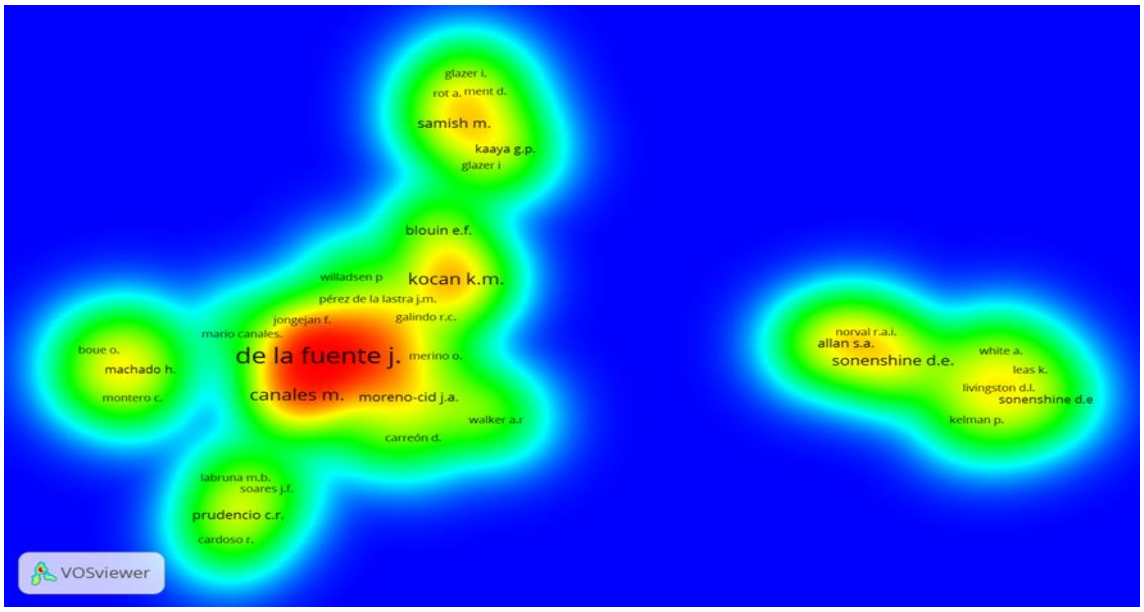

Figure 4. Coherence density diagram - Source: Own elaboration using VOSviewer software.

4.1.3 Keyword Occurrence

The occurrence of the keywords is presented in figure 5, used by the authors of 480 articles. The map is

composed of 5 clusters, which are represented by different colors. Each constituent element of the network, called the node, is one of the 43 keywords that had at least 3 occurrences between them, with 276 links.

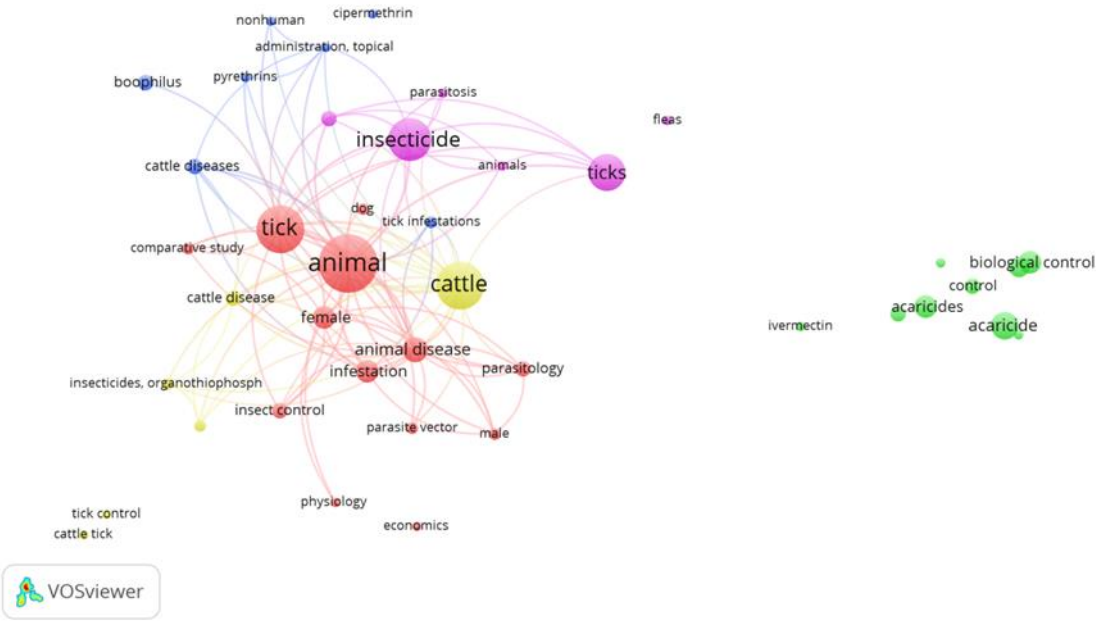

Figure 5. Occurrence of keywords - Source: Own elaboration through VOSviewer software.

You can see that in the center of the map is the keyword "animal", whose symbol is the largest of all the other keywords, indicating that it is the one with the highest occurrence. This keyword comprises group 1 (in red color), which counts on another twelve words, among them tick, animal disease, infestation, female, parasitology and others. The grouping 2 (green) with 9 keywords acaricide, acaricides, amitraz, biological control, ivermectin, amblyomma americanum, boophilus microplus, tick-borne diseases and control has a lesser connection among the other clusters. The grouping 3 (blue) with seven keywords shows the relationship tropical administration, boophilus, cattle diseases, cipermethrin, nonhuman, pyrethrins, tick infestacions. In cluster 4 (yellow) is composed of six keywords, which indicate a more focused discussion on cattle, cattle diseases, cattle tick, insecticides organothiophosph, organophosphate insecticide, tick control. Finally, group 5 (pink), which has six keywords and calls attention to the words insecticide, ticks, insecticides, animals, fleas and parasitoses that suggest the actual physical space around the theme.

4.1.4 Rank distribution of journals

In Figure 6 the SCimago Journal & Country Rank, which includes periodic indicators, the distribution rank of the journals was evaluated, the best quartile being selected (values from a series dividing it into four equal parts) and 107 Q1, 51 Q2, Q3 and Q4.

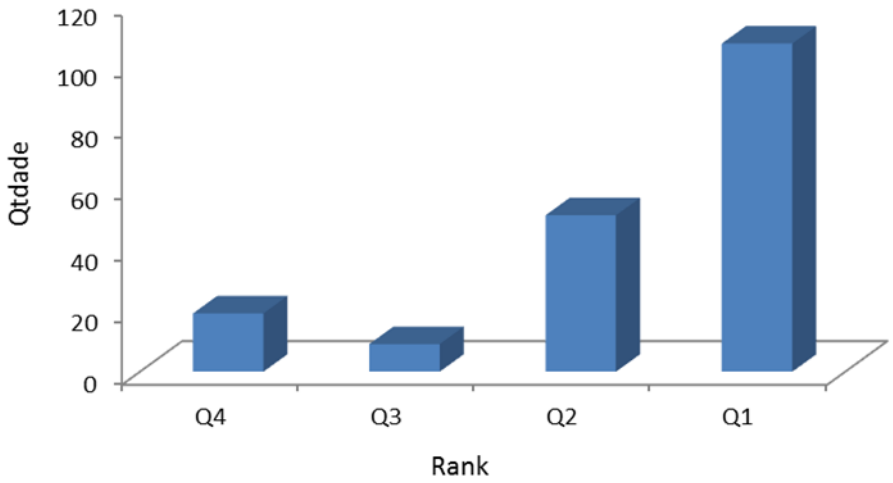

Figure 6. SCImago Journal Rank: distribution of articles - Source: Own elaboration.

Of the 41 journals identified in SCimago Journal & Country Rank the countries of origin of the publications were selected, totaling 186 articles, the Netherlands leads the list with a frequency of 82 published articles, representing 44% of the total amount, followed by the United States with 24 Articles, 27.9% of the total amount. There is a concentration between these two countries, accounting for 71.9% of the publications on the subject, while the remaining 28.1% are distributed among 14 countries. Figure 7 shows the sixteen countries with the largest number of publications.

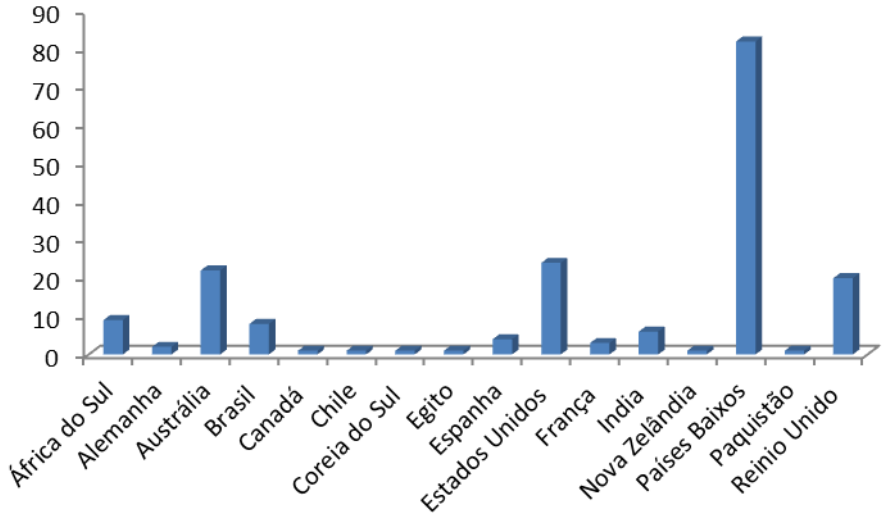

Figure 7. Countries of the periodicals - Source: Own elaboration.

5. Conclusion

In general, tick control is of great importance to both human and animal health. This article proposed to perform a quantitative bibliometric analysis of related scientific publications on the subject of tick control.

With the results obtained in the bibliometric analysis, a total of 480 articles selected after the criterion of inclusion of the documents indexed in the bases Scopus, Web of Science, Medline / Pubmed, Science Direct found a greater attention of the academy from 1992 with 19 Publications, with a growth in the number of publications mainly between the years 2014 and 2016 demonstrating a great interest in the area in the last 25 years. The studies are from researchers concentrated in the Netherlands, the United States, Australia and the United Kingdom, and the authors of those countries contribute the most, with the greatest amount of published works. It is hoped that the results presented in this article will contribute to the dissemination and awareness of the importance of tick control and contribute to the growth of research on the subject, especially in Brazil where there are few publications in journals.

6. Acknowledgement

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