Black Sea Journal of Agriculture

GLOBAL RESEARCH ON BLUETONGUE: A BIBLIOMETRIC ANALYSIS

Hakan SERİN[1]*, Muslu Kazım KÖREZ[1], Sinan SİREN[2]

[1]*Selcuk University, Faculty of Veterinary Medicine, Department of Biostatistics, 42150, Konya, Türkiye*
[2]*Selcuk University, Faculty of Veterinary Medicine, Department of Physiology, 42150, Konya, Türkiye*

Abstract: Bluetongue (BT) is a viral disease characterized by swelling and cyanosis of the tongue, capable of infecting both domestic and wild animal species. Bluetongue virus (BTV) can cause an outbreak in any region of the world where favorable temperature and vector presence conditions exist. For this reason, BTV studies remain an active field in the literature and the research network of this field continues to develop. This paper aims to identify the most influential research elements and collaborations in the BTV field, with a discussion of results based on existing literature. To discover the current literature on BTV, the Web of Science database was employed. The dataset consisted of 1315 articles. The "Bibliometrix" R package and the VOSviewer program were utilized for data analysis. The number of BT studies rose dramatically between 2005 and 2016 with the appearance of BTV in Europe. The USA and England were determined as the most influential countries. The *Veterinary Microbiology* and *Medical and Veterinary Entomology* journals were identified as the most prominent journals of the field. It has been determined that serological studies have been a focal point and collaborations have been strengthened in the field of BTV. Conversely, financing sources and collaboration levels regarding BTV studies were found to be inadequate in African and Asian countries. This paper is expected to provide information to researchers interested in BTV studies about the intellectual structure of the field.

Keywords: Bluetongue, Culicoides, Surveillance, Serology, Veterinary bibliometric

*Corresponding author: Selcuk University, Faculty of Veterinary Medicine, Department of Biostatistics, 42150, Konya, Türkiye
E mail: mkkorez@gmail.com (M. K. KÖREZ)
Hakan SERİN   https://orcid.org/0000-0002-1290-4547
Muslu Kazım KÖREZ   https://orcid.org/0000-0001-9524-6115
Sinan SİREN   https://orcid.org/0000-0003-2182-5047

Cite as: Serin H, Körez MK, Siren S. 2024. Global research on bluetongue: A bibliometric analysis. BSJ Agri, 7(3): 317-326.

1. Introduction

Bluetongue (BT) is a non-infectious, arthropod-borne viral disease of ruminants. The causative agent of the disease is known to be the Bluetongue virus (BTV), which belongs to the Orbivirus genus of the Reoviridae family (Mertens et al., 2005; Ranjan et al., 2015). BTV is recognized as a potentially devastating disease of ruminants by the OIE (World Organization for Animal Health) and FAO (Food and Agriculture Organization) (Rao et al., 2017). BT was first emerged in South Africa. In the following years, it was seen in Europe, America, the Middle East, and Asian countries (Monaco et al., 2006). BTV causes economic losses due to high morbidity, mortality, abortion, fetal abnormalities, and weight loss in ruminants. Beyond impeding the progress of countries in the domain of animal husbandry, it also adversely impacts the national economies by incurring supplementary expenses for disease management (Gethmann et al., 2020).

BTV is transmitted to the host through specific species of mosquitoes belonging to the genus Culicoides (Batten et al., 2008). BTV outbreaks exhibit seasonality, typically emerging during the summer and autumn seasons. These occurrences can emerge in any part of the world characterized by tropical, subtropical, and temperate climatic zones, with the presence of vectors and suitable hosts. BTV has the potential to impact both domestic and foreign ruminants. However, clinical manifestations are typically evident in sheep whereas, cattle and other domestic ruminants mostly exhibit subclinical symptoms. Typically, clinical symptoms of BTV infection include fever, edema of the ears, oral ulcers, cyanosis of the tongue, and muscle necrosis, often resulting in fatal outcomes (Savini et al., 2008; Schulz et al., 2012).

Bibliometrics is a quantitative analysis and visualization of research outputs derived from databases within a specific research area (Yu et al., 2020). Bibliometric analysis employs a set of metrics to assess and evaluate researchers, institutions, journals, countries, and research topics. Bibliometric studies aim to provide researchers with a priori information through a map of the relevant field (Wang et al., 2020).

A literature survey showed that bibliometric analysis has become a prevalent tool for uncovering the intellectual structure of the field of animal diseases in recent years. For example, Kai et al. utilized bibliometric analysis to determine research topics for Brucellosis disease. Their findings revealed that studies mostly focused on cattle as an intermediate host and epidemiological studies on brucellosis were estimated to increase in the coming years (Kai et al., 2023). Elisha et al. examined research

funding and collaborations in African countries on the Anthrax outbreak. They reported strong cooperation in the African continent between Kenya, Nigeria, South Africa, and South Africa identified as the country providing the most financing (Elisha et al., 2024).

This study explores the current trends, cooperations, and contributions within the field of BTV. Through this examination, the study aims to present researchers with a general framework of the field and general knowledge of the related literature. The most influential researchers, institutions, journals, countries, as well frequently used keywords were identified and discussed based on the quantitative metrics.

2. Material and Method

2.1. Research Methods

In general, bibliometric analysis is composed of 2 steps, performance analysis and visualization. Performance analysis enables meticulous measures of research elements according to certain metrics. On the other hand, the visualization step includes visual presentations of results obtained through performance analysis to facilitate a clear understanding and interpretation of the findings (Zupic and Čater, 2015). Accordingly, changes in research trends over time and gaps within a given field can be revealed; additionally, popular topics and the most influential research items (researchers, journals, countries, etc.) can be identified (Aria and Cuccurullo, 2017). In the performance analysis, various indicators, including the *h*-index, *g*-index, *m*-index, citation count, publication count, Journal Impact Factor (JIF), and JIF Quartile, were employed. Furthermore, bibliometric laws such as Lotka's and Bradford's Laws were utilized.

2.2. Data Sources and Statistical Analysis

Clarivate Analytics' database Web of Science (WoS) was used to explore the existing literature on Bluetongue disease in veterinary medicine. WoS and Scopus, as the largest databases, are known for publishing studies that adhere to rigorous publication ethics (Merigó and Yang, 2017). A search conducted on 3 January 2024 using the terms "bluetongue" OR "bluetongue virus" OR "BTV" resulted in 2351 studies in the field of veterinary sciences. After limiting the search to document type (research article) and language (English), 1640 studies were listed. Upon content review, 325 articles related to other animal diseases or those concentrating on Culicoides mosquitoes, the vector of the Bluetongue virus without directly addressing the BT virus were excluded from the initial pool of 2351 studies. Consequently, the bibliographic dataset consisted of 1315 articles complying with the search parameters (Figure 1).
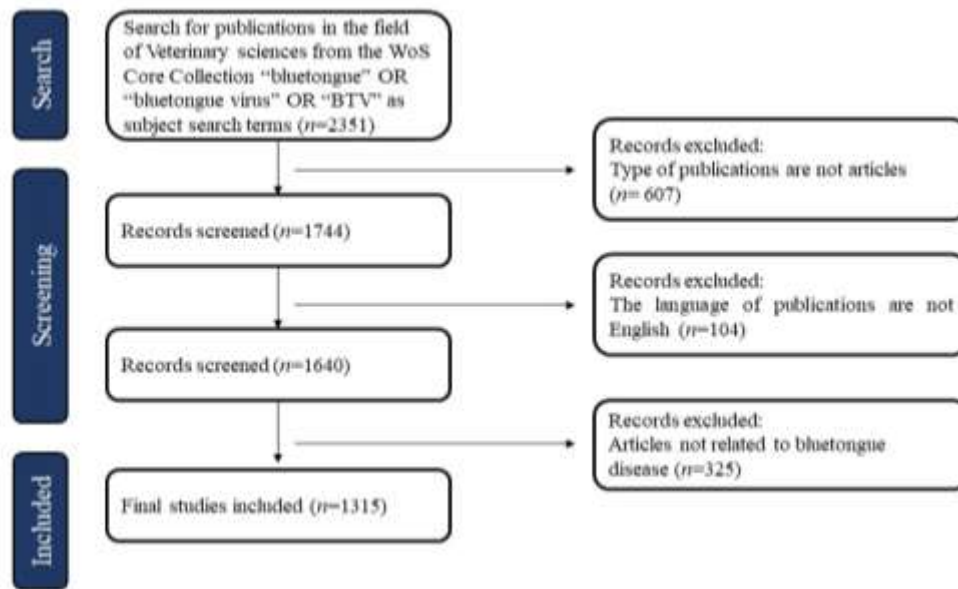

Figure 1. The publication selection process for bibliometric analysis.

Many statistical programs are used for bibliometric analysis. In this study, R "Bibliometrix" package was preferred for bibliometrics analysis. Furthermore, for visualization of the findings, VOSviewer, a commonly used program in bibliometric analyses, was employed (Aria and Cuccurullo, 2017; Van Eck and Waltman, 2017). The performance analyses of academicians, journals, institutions, and countries were conducted using the "Bibliometrix" package. Co-authorship and keyword network analyses were performed on the VOSviewer program.

3. Results

3.1. General Publication Trends

A general examination of the bibliometric data revealed that articles from 65 different journals published between 1980 – 2023 were included in the dataset. Over this 43-year duration, a total of 1315 articles meeting the search criteria were published. The cumulative count of authors amounted to 4189 and the number of single-authored articles was 69. The citation count per article was 20.62 and the total citation count was 17782. The

bibliographic data comprised 1706 keywords plus and 2182 author keywords. Author collaboration statistics revealed that the average number of articles per author was 0.31, authors per article were 3.18, co-authors per article were 5.42, the international co-authorship rate was 25.93%, and the collaboration index was 3.32. The number of authors contributed to these studies was 4189 and author names were used 7127 times. The author footprint index was found to be 0.75. The majority of the publications were (94.75%) multi-authored (Table 1).

Table 1. Main statistics on Bluetongue studies

Description	Results
Main Information About Data	
Timespan	1980:2023
Sources (journals, books, etc.)	116
Documents	1315
Annual growth rate (%)	2.31
Document average age	15.8
Average citations per doc	20.62
References	17782
Document Types	
Article	1246
Article; early access	5
Article; proceedings paper	37
Document Contents	
Keywords Plus (ID)	1706
Author's Keywords (DE)	2182
Authors	
Authors	4189
Author appearances	7127
Authors of single-authored documents	49
Authors of multi-authored documents	4140
Authors Collaboration	
Single-authored documents	69
Multi-authored documents	1246
Authors per document	3.18
Documents per author	0.31
Co-Authors per document	5.42
Collaboration index	3.32
Author footprint index	0.75
International co-authorships (%)	25.93

The examination of the publication trend of BTV studies revealed a significant increase in the number of articles between 1980 – 2023. The annual growth rate was 2.1%. However, this growth did not follow a linear trajectory. Until 2005, the number of articles was steady with an annual average of about 20 but rose dramatically between 2005 – 2016 maintaining a continuous upward trend. From 2016 onward, the number of articles showed a decline with an annual average of 30 until the beginning of 2024 (Figure 2).

Figure 3 visualizes the relationships between the top 20 most influential "sources (SO)", "authors (AU)", and "keywords (DE)". Accordingly, *Transboundary and Emerging Diseases* and *Veterinary Microbiology* were identified as the most influential journals in the field. Philip Scott Mellor and Stephan Zientara emerged as two of the most influential authors. The most frequently preferred keywords were "bluetongue", "bluetongue virus", and "culicoides".

3.2. Most Influential Journals

Utilizing Bradford's law, 5 journals were determined as primary sources in the field. These journals were *Veterinary Microbiology*, *Transboundary and Emerging Diseases*, *Preventive Veterinary Medicine*, *Medical and Veterinary Entomology*, and *Journal of Medical Entomology*. An overall examination of the *h*-index, *g*-index, the number of articles, and the number of citations indicated that the most influential journals were *Veterinary Microbiology* and *Medical and Veterinary Entomology*, respectively. The aims and scope of *Veterinary Microbiology*, the most influential journal in the field, were comprehensively examined and it was found that the journal mostly includes innovative studies on viral and bacteriological diseases in domestic and farm animals. The examination of BTV articles in the field indicated that studies mostly focused on serological and molecular BTV research. On the other hand, the *Medical and Veterinary Entomology* journal focused on important research on insects, ticks, and other arthropods in the veterinary field. The review of BT virus studies in this journal indicated that studies were on culicoides, the vector of BTV, and the diseases caused by it. The international collaboration of the journals mostly exceeded 20% (Table 2).

3.3. Analysis of Prolific Authors

The metrics indicating the scientific productivity of the top ten most influential authors in the field of BTV are listed in Table 3. Philip Scott Mellor (England) and Nigel James Maclachlan (USA) held the top two positions based on *h*-index and *g*-index scores, total publication count, and citation count. The author with the highest *m*-index score was Simon T. Carpenter (England). The international collaboration rate among the top ten most influential authors in the field of BTV was found to be high (average 49.86%). The only author with an international collaboration rate below 40% was Bennie Irve Osburn. Lotka's law estimates that 60% of authors contribute to the field with one, 15% with two, and 7% with three articles (Sudhier, 2013). It was determined that in the BTV field, 75.3% of the authors contributed to the field with one, 13% with two, and 4.8% with three articles. Therefore, the distribution did not comply with Lotka's law. It was observed that the number of single-authored articles was higher than expected, while the number of three-authored articles was lower. The primary reason for this result can be attributed to the popularity of the field between 2008 and 2016, with the number of studies during this period accounting for 41.5% of the total studies in the literature. Furthermore, according to Lotka's law, authors with more than 5 articles can be considered core authors in the BTV field.

To determine the collaborations among the most influential authors in the field, the co-authorship interactions between the authors with at least 5 articles on BTV were visualized as shown in Figure 4. According to the analysis of the authors with the highest co-authorships, a total of 131 authors combined under 12 groups were identified, accounting for 508 interactions. The top three authors with the highest co-authorship interactions were Giovanni Savini (86), Stephan Zientara (82), and Corinne Sailleau (73), respectively.
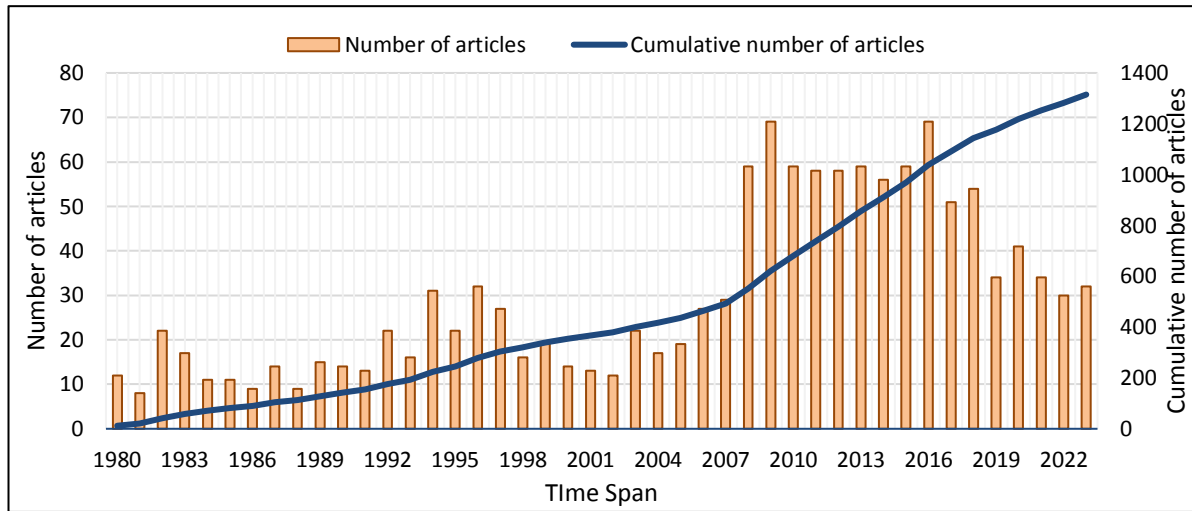

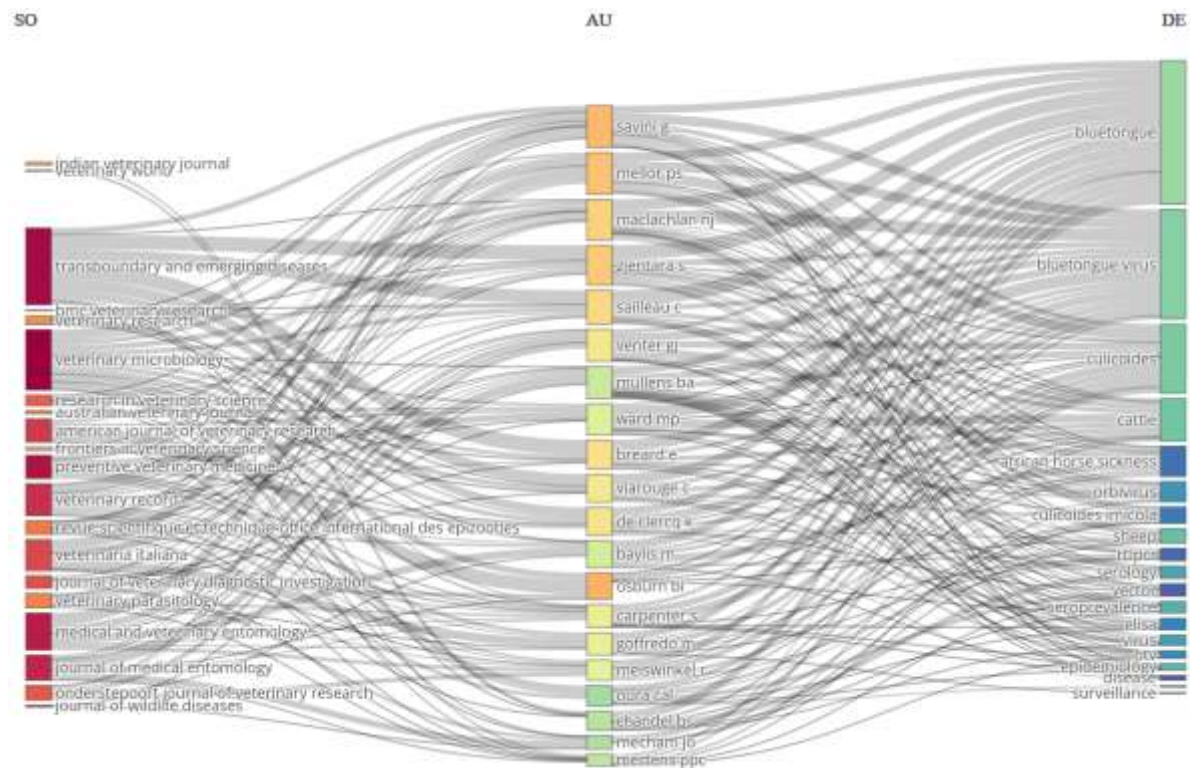**Figure 2.** Annual scientific production on Bluetongue in Veterinary Medicine.

Figure 3. Bluetongue three area graph, Sources (left), Authors (middle), and Keywords (right).

Table 2. The *h*-index, *g*-index, *m*-index, and other scientific indices of the journals (top 10)

Source	h index	g index	m index	TC	NP	CI	IC (%)	JIF	JIF Quartile	Country
Veterinary Microbiology	33	50	0.75	3599	137	26.27	26.37	3.3	Q1	Netherlands
Medical and Veterinary Entomology	28	43	0.80	2120	71	29.86	44.48	1.9	Q2	England
Preventive Veterinary Medicine	28	46	0.70	2441	81	30.14	40.89	2.6	Q1	Netherlands
Veterinary Record	27	47	0.61	2358	62	38.03	4.22	2.2	Q2	England
Transboundary and Emerging Diseases	24	37	1.50	1808	93	19.44	43.54	4.3	Q1	Germany
American Journal of Veterinary Research	23	34	0.52	1417	58	24.43	10.14	1	Q3	USA
Journal of Medical Entomology	23	35	0.59	1417	66	21.47	29.81	2.1	Q2	USA
Journal of Wildlife Diseases	21	29	0.58	1075	53	20.28	29.85	1.3	Q2	USA
Veterinary Parasitology	18	24	0.64	760	24	31.67	32.74	2.6	Q1	Netherlands
Journal of Veterinary Diagnostic Investigation	16	25	0.50	697	35	19.91	23.13	1.5	Q2	USA

NP= number of publications, TC= total citations, CI= citation impact, IC= international collaborations, JIF= journal impact factor.

Table 3. The *h*-index, *g*-index, *m*-index, and other scientific indices of the authors (top 10)

Author	h index	g index	m index	TC	NP	CI	IC (%)	Country
Mellor, Philip Scott	27	39	0.675	2252	39	57.74	60	England
Maclachlan, Nigel James	24	36	0.585	1692	36	47.00	61.5	USA
Zientara, Stephan	19	30	0.864	929	37	25.11	54.8	France
Meiswinkel, Rudy	18	20	0.600	1251	20	62.55	44.4	Italy
Osburn, Bennie Irve	18	28	0.409	901	43	20.95	10	USA
Carpenter, Simon T.	16	20	0.842	1053	20	52.65	62.9	England
Sailleau, Corinne	16	23	0.727	591	33	17.91	44.7	France
Savini, Giovanni	16	30	0.842	987	40	24.68	52.3	Italy
Venter, Gert Johannes	16	22	0.485	883	22	40.14	54.9	South Africa
Baylis, Matthew	15	19	0.577	1009	19	53.11	53.1	England

NP= number of publications, TC= total citations, CI= citation impact, IC= international collaborations.
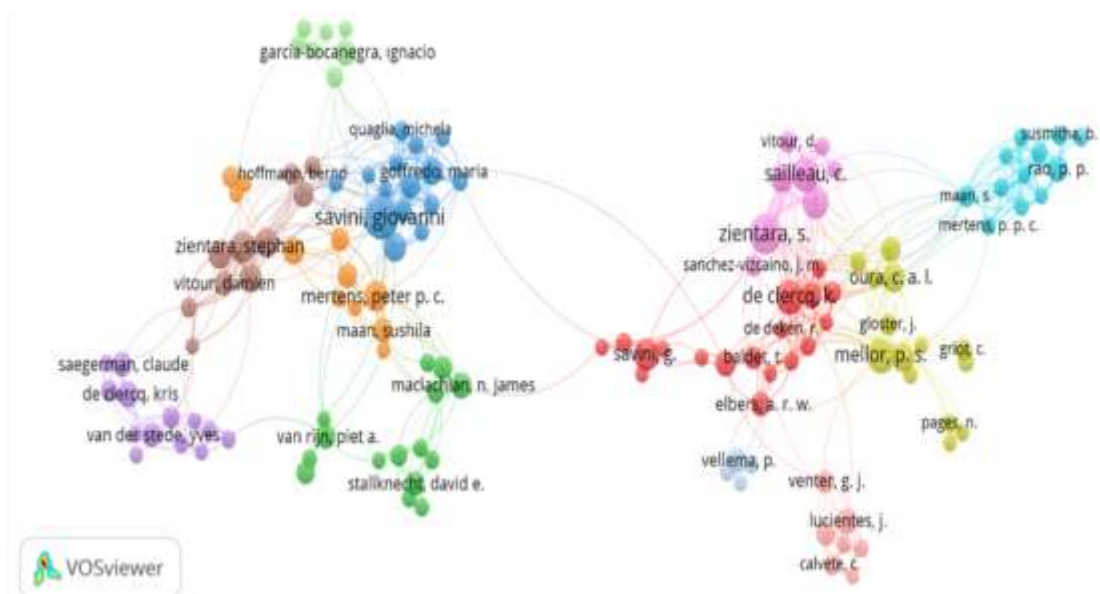

Figure 4. Co-authorship network.

3.4. Contribution of Institutions

In total, 1173 institutions associated with a total of 1315 articles on BTV were determined. The article count per institution was almost 1. This figure indicates the high cooperation in the field. The productivity of institutions on BTV studies was examined and UC Davis (USA), Institute of Animal Health (Japan), and University of Georgia (USA) were identified as the institutions with the highest number of articles. Furthermore, these institutions were also identified as the top three institutions according to *h*-index scores. Regarding international collaborations among institutions, the top three were the University of Liege (70.04), Pirbright Institute (69.30), and Onderstepoort Veterinary Institute (66.56), respectively (Table 4).

Table 4. The *h*-index and other scientific indices of Affiliations (top 10)

Affiliation	Articles	IC (%)	Country
University of California Davis	164	42.10	USA
Institute of Animal Health	135	27.21	Japan
University of Georgia	71	32.26	USA
University of Pretoria	63	51.44	South Africa
Indian Veterinary Research Institute	55	26.66	India
Pirbright Institute	50	69.30	England
Onderstepoort Veterinary Institute	43	66.56	South Africa
University of Florida	42	37.28	USA
University of Liege	41	70.04	Belgium
University of California Riverside	35	42.37	USA

IC: international collaboration.

3.5. Contribution of Countries

Table 5 presents some metrics including article and citation counts of countries on BTV studies. Countries with the highest article counts were the USA and England. These 2 countries accounted for 28.9% of the global BTV literature. Furthermore, the Netherlands was identified as the country with the highest category-specific citation index (CNCI). Multiple country publication (MCP) counts of the countries were examined and Belgium (0.462) was identified as the country with the highest MCP (0.462), despite it did not achieve an MCP ratio of 50%. Moreover, although the USA had the highest publication count, it exhibited the lowest MCP ratio (0.134).

The collaboration network of the countries was examined and it was found that 49 countries grouped under 16 clusters. However, only 4 clusters could build nodes within them. The dimensions of the nodes within the network represent the publication frequency of countries in the selected field. Countries within the same cluster demonstrated collaborations on research publications. According to the collaboration network, the highest collaborations were observed in the clusters involving the USA, England, and France. Considering the number of nodes and total node powers, the USA, England, France, and Italy were identified as the most influential countries in the collaboration network (Figure 5).

Table 5. Publication count and collaboration metrics of the countries (top 10)

Country	TC	NP	CI	Frequency	SCP	MCP	MCP Ratio	Links	TLS
USA	6141	268	22.91	0.204	232	36	0.134	48	134
England	3775	112	33.71	0.085	77	35	0.313	46	209
India	799	105	7.61	0.080	95	10	0.095	5	12
Australia	1283	72	17.82	0.055	59	13	0.181	17	41
France	1572	71	22.14	0.054	43	28	0.394	24	143
Spain	1494	68	21.97	0.052	52	16	0.235	21	74
Italy	1894	65	29.14	0.049	43	22	0.338	28	111
Belgium	1443	52	27.75	0.040	28	24	0.462	12	84
South Africa	1371	51	26.88	0.039	40	11	0.216	24	84
Netherlands	1781	42	42.40	0.032	28	14	0.333	13	81

NP= number of publications, TC= total citations, CI= citation impact, SCP= single country publication, MCP= multiple country publication, TLS= total link strength.
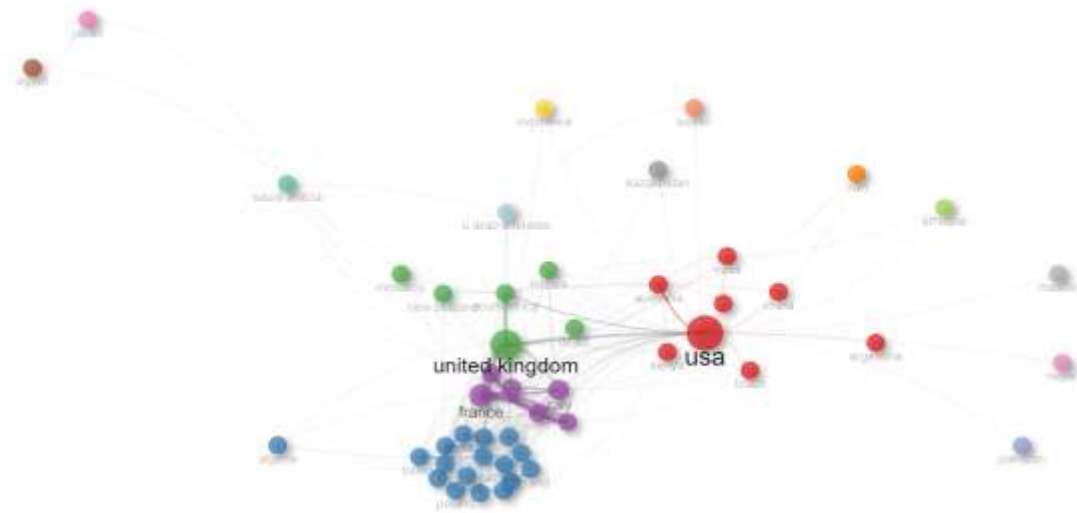
Figure 5. Map of cooperation between countries.

3.6. Keyword Analysis

Keyword analysis is important to assess the evaluation of the studies and research topics in a given field. The keyword network showing the most frequently used author keywords (used at least 5 times) is illustrated in Figure 6. The evolution of keywords used in the field indicates the changing significance of concepts in BTV studies over the years and reveals the current research topics. Accordingly, the keyword network indicated that the terms "bluetongue", "bluetongue virus", and "culicoides" were frequently used together. Furthermore, the terms "vector borne diseases", "surveillance", "wildlife", and "serotype 4" were often used in recent studies. The examination of the keyword network also revealed that studies on vector-borne diseases and the seasonality of the disease were mostly focused on cattle species. Moreover, a higher concentration of studies on the BTV serotype 8 was found in South Africa; while the

number of studies examining the effects of BT on abortion in camels was higher in Saudi Arabia. Additionally, since epizootic hemorrhagic disease and BTV belong to the Reoviridae family, serological and experimental infection studies using both agents were frequently conducted.

3.7. Co-citation Analysis

Co-citation analysis reveals how frequently two reports are cited together by other studies. A minimum co-citation count of 20 was set for BTV studies and a total of 218 journals were listed. The top 3 journals with the highest citations were *Veterinary Record* (1647 citations, JIF 2023 = 2.2, Q2), *Veterinary Microbiology* (1515 citations, JIF 2023 = 3.3, Q1), and *American Journal of Veterinary Research* (1259 citations, JIF 2023 =1, Q3). In general, these journals exhibited high Journal Impact Factor (JIF) values and were considered prestigious and influential within the field (Figure 6).
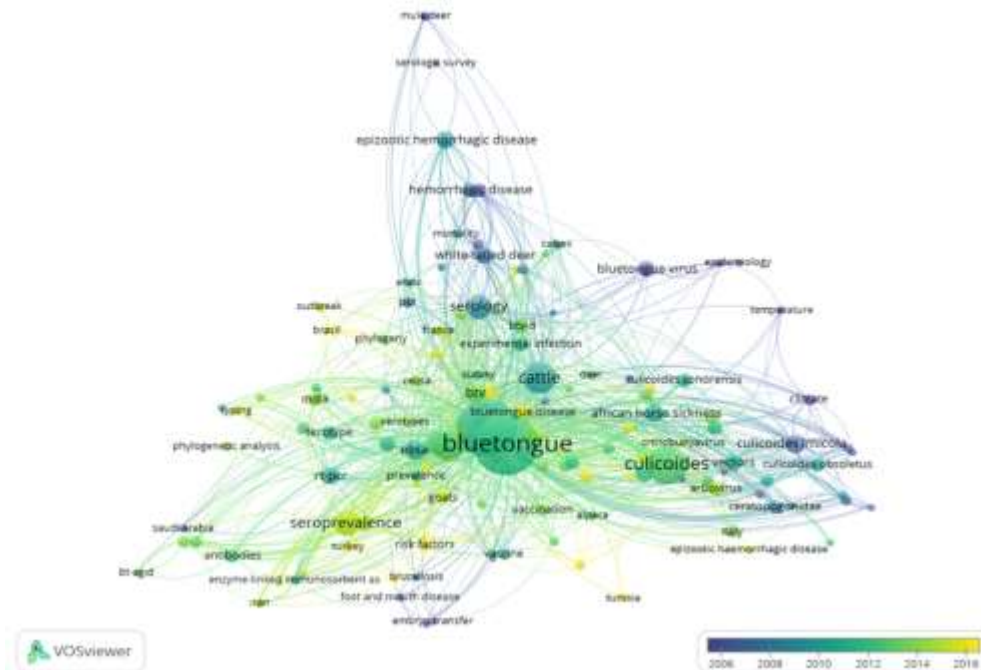

Figure 6. Network analysis of authors' keywords.

Co-cited references were examined and accordingly, 136 references were determined among 17758 references with a minimum co-citation count of 20. The study exploring the transfer of BTV to the host by Culicoides, titled "*Culicoides Biting Midges: Their Role as Arbovirus Vectors*", authored by Philip Scott Mello emerged as the highest co-cited research (Year: 2000, co-citations:176). The study with the second highest co-citation count was "*Climate change and the recent emergence of bluetongue in Europe*" by Bethan V. Purse. In this study, Purse examined the epidemiology of BTV in Europe (Year: 2005, co-citations:14 6). It was found that the top 10 articles with the highest co-citation counts were about the prevalence of BTV among different animal species and regions.

4. Discussion

BTV was initially confined to the South African region but has spread globally over time. BTV causes economic losses worldwide primarily due to the impact of regional culicoides vectors (Subhadra et al., 2023). Therefore, BTV remains an attractive topic among researchers. Due to the ongoing relevance of the topic, the intellectual development of BTV studies was examined using the data obtained from the WoS database. The annual growth rate of studies in this field was found to be %2.31. The volume of scientific studies across all disciplines has exhibited an average annual growth rate of 3% over the past 30 years (Bornmann and Mutz, 2015). Accordingly, it can be argued that BTV studies exhibited a similar growth with all literature. Regarding publication trends on BTV, a dramatic rise was observed between 2008 and 2018 with a relatively stable pattern in other periods. Starting in 2006, BTV cases (BTV-8) rapidly spread in Europe. During this period, 50,000 new cases were reported in Europe, particularly in North Europe, and new BTV strains were identified. Furthermore, vaccine development studies have also started during this period (Niedbalski and Fitzner, 2018). Due to vaccine development studies with a focus on serological studies and research on culicoides vectors, the number of BTV-related studies has displayed a dramatic rise in European countries. The growing research in this field has revealed that the virus tends to propagate in various serotypes among domestic animals (Mayo et al., 2020). Due to the risk of the emergence of new serotypes of BTV, future funding should be directed toward economically disadvantaged countries, particularly in Africa, to facilitate efforts in combating the disease (MacLachlan and Osburn, 2006). Financial support to projects on BTV plays a crucial role in the collective effort to combat the virus by facilitating rapid global sharing of information. For instance, BTV-GLUE is a project carried out in collaboration with MRC-University of Glasgow Centre for Virus Research, Nottingham University, The Pirbright Institute, and PALE-Blu (Pathogen Livestock Environment interaction involving bluetongue) (Singer et al., 2019). For the development of genomic studies on BTV, institutions from Asian and African countries should also be included in institutional collaboration projects. Considering the obtained keyword network, the increase in virus-vector and seroprevalence studies was found to be remarkable due to the role of the vector in the spread of BTV. Furthermore, RT-PCR and ELISA were identified as current diagnosis tools.

The spread of BTV in Europe has prompted some authors to develop a higher interest in this field and specialize accordingly. Two of the most influential authors were Philip Scott Mellor and Nigel James Maclachlan. These authors also developed collaboration networks with their high participation in the field. The only author from South Africa, the homeland of the disease, is Gert Johannes Venter. Furthermore, the top ten most influential journals in the field of BTV mostly implement the open-access publication method. It is important to note that authors from South Africa and other underdeveloped or developing countries, lacking the opportunity to cover open access fees, often prefer journals with lower citation indices. Journals focusing on BTV research were mostly animal diseases and parasitology journals. Despite being the first country in article count, the USA displayed a relatively lower MCP value for these articles. Additionally, since the disease is affected by seasonality due to culicoides vectors, it is observed in only certain regions of the USA (Rivera et al., 2021).

The findings indicated that researchers from the USA mostly established collaborations with China, Brazil, and Argentina. Among European countries, a strong collaboration, particularly England-based, was observed. Additionally, England was the country with which South Africa established the largest number of collaborations.

To prevent new BTV-related outbreaks, developed countries should enhance serological studies with African countries and establish a more extensive collaboration network. As BTV occurs in different serotypes regionally, cooperation networks were mostly observed between countries from the same continent (Maclachlan and Mayo, 2013). In general, Asian and African countries exhibited lower article counts and collaborations.

5. Conclusion

BTV is a viral disease occurring globally in various serotypes, primarily transmitted by Culicoides vectors, causing substantial economic losses in ruminants. Accordingly, the development of BTV studies, increase/decline trends over time, as well as the most influential authors, countries, institutions, and journals were examined over a 43-year period using the WoS database. A total of 1315 scientific papers were statistically reported using mapping methods.

A comprehensive examination revealed a shift in publication trends towards the USA and the European continent, with the emergence of BTV in the USA and Europe after 2000. Insufficient collaborations in African

and Asian countries have prevented the establishment of adequate research accumulation in these regions. For this reason, research centers should be established with the support of developed countries and institutions, involving underdeveloped (especially African) countries. Therefore, by fostering collaboration, BTV's new serotypes can be identified earlier, and efforts for vaccine development and prevention practices can be carried out through global platforms.

This study, by offering a comprehensive overview of the field, can serve as a guide for researchers in their future studies on the BT virus. Through this paper, researchers can access various useful information including details about other researchers interested in BTV and serotypes of the disease in their regions. This study presents an objective structure of the field quantitatively but has some limitations. The WoS database offers an extensive collection of academic journals and is a commonly utilized resource in bibliometric studies. The main limitations of this study are that studies outside the WoS database are not included, and only English studies are incorporated into the analysis.

Author Contributions

The percentage of the author(s) contributions is presented below. All authors reviewed and approved the final version of the manuscript.

	H.S.	M.M.K.	S.S.
C	70	20	10
D	50	30	20
S	100		
DCP	60	30	10
DAI	40	40	20
L	30	40	30
W	50	20	30
CR	20	50	30
SR	80	10	10
PM	30	40	30

C= concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Consideration

Ethics committee approval was not required for this study because of there was no study on animals or humans. The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to.

References

Aria M, Cuccurullo C. 2017. Bibliometrix: An R-tool for comprehensive science mapping analysis. J Inform, 11(4): 959-975.

Batten C, Bachanek-Bankowska K, Bin-Tarif A, Kgosana L, Swain A, Corteyn M, Oura C. 2008. Bluetongue virus: European Community inter-laboratory comparison tests to evaluate ELISA and RT-PCR detection methods. Vet Microbiol, 129(1-2): 80-88.

Bornmann L, Mutz R. 2015. Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references. J Assoc Inform Sci Technol, 66(11): 2215-2222.

Elisha IL, Onikisateinba A, Joel GS, Luka PD, Joshua BI, Jagab SH, Sati NS. 2024. Unveiling the global reach of African anthrax research: A bibliometric study. Sci One Health, 3: 100052.

Gethmann J, Probst C, Conraths FJ. 2020. Economic impact of a bluetongue serotype 8 epidemic in Germany. Front Vet Sci, 7: 65.

Kai S, Yuanlin Z, Rui S, Mingming G, Dan H, Lei R, Lixin S. 2023. Bibliometric analysis of brucellosis by CiteSpace. J Pharmaceut Pract, 6: 310-315.

Maclachlan NJ, Mayo CE. 2013. Potential strategies for control of bluetongue a globally emerging Culicoides-transmitted viral disease of ruminant livestock and wildlife. Antiviral Res, 99(2): 79-90.

MacLachlan NJ, Osburn BI. 2006. Impact of bluetongue virus infection on the international movement and trade of ruminants. J American Vet Med Assoc, 228(9): 1346-1349.

Mayo C, McDermott E, Kopanke J, Stenglein M, Lee J, Mathiason C, Perkins TA. 2020. Ecological dynamics impacting bluetongue virus transmission in North America. Front Vet Sci, 7: 186.

Merigó JM, Yang JB. 2017. A bibliometric analysis of operations research and management science. Omega, 73: 37-48.

Mertens P, Attoui H, Duncan R, Dermody T. 2005. Reoviridae. Virus Taxonomy Eighth Report of the International Committee on Taxonomy of Viruses, 2005: 445- 447.

Monaco F, Camma C, Serini S, Savini G. 2006. Differentiation between field and vaccine strain of bluetongue virus serotype 16. Vet Microbiol, 116(1-3): 45-52.

Niedbalski W, Fitzner A. 2018. Impact of climate change on the occurrence and distribution of bluetongue in Europe. Med. Weter, 74(10): 634-639.

Ranjan K, Minakshi P, Prasad G. 2015. Bluetongue: Indian perspective. Acta Virol, 59(4): 317-337.

Rao PP, Hegde NR, Singh KP, Putty K, Hemadri D, Maan NS, Mertens PP. 2017. Bluetongue: aetiology epidemiology pathogenesis diagnosis and control. Emer Re-emerg Infect Diseas Livestock, 3-54.

Rivera NA, Varga C, Ruder MG, Dorak SJ, Roca AL, Novakofski JE, Mateus-Pinilla NE. 2021. Bluetongue and epizootic hemorrhagic disease in the United States of America at the wildlife–livestock interface. Pathogens, 10(8): 915.

Savini G, MacLachlan N. J, Sanchez-Vizcaino J.-M, Zientara S. 2008. Vaccines against bluetongue in Europe. Comparat Immun Microbiol Infect Diseas, 31(2-3): 101-120.

Schulz C, Eschbaumer M, Rudolf M, König P, Keller M, Bauer C, .Hoffmann B. 2012. Experimental infection of South American camelids with bluetongue virus serotype 8. Vet Microbiol, 154(3-4): 257-265.

Singer J. B, Nomikou K, Hughes J, Mertens P, Gifford R, Palmarini M. 2019. BTV-GLUE: a new bioinformatic resource for genomic studies of Bluetongue virus. Access Microbiol, 1(1A): 648.

Subhadra S, Sreenivasulu D, Pattnaik R, Panda B. K, Kumar S. 2023. Bluetongue virus: Past present and future scope. J Infect Develop Countries, 17(02): 147-156.

Sudhier K. P. 2013. Lotka's law and pattern of author productivity in the area of physics research. DESIDOC J Library Inform Technol, 33(6): 457-464.

Van Eck NJ, Waltman L. 2017. Citation-based clustering of publications using CitNetExplorer and VOSviewer. Scientometrics, 111: 1053-1070.

Wang C, Lim MK, Zhao L, Tseng ML, Chien CF, Lev B. 2020. The evolution of Omega-The International Journal Management Science over the past 40 years: A bibliometric overview. Omega, 93: 102098.

Yu Y, Li Y, Zhang Z, Gu Z, Zhong H, Zha Q, Chen E. 2020. A bibliometric analysis using VOSviewer of publications on COVID-19. Ann Transl Med, 8(13): 816.

Zupic I, Čater T. 2015. Bibliometric methods in management and organization. Organiz Res Methods, 18(3): 429-472.