Research Paper

Bibliometric Analysis and Its Application on Milk Production

Şenol Çelik*

Department of Animal Science, Biometry Genetics Unit, Agricultural Faculty, Bingol University, Bingol, Turkey

ABSTRACT: The aim of the study is to analyze 423 studies with the statement of "milk production" on the article title published within the scope of SCI-Expanded in 2019 regarding milk production with bibliometric analysis and to address the trends of recent years. In this context, a scanning was made under the title of "milk production" in the Web of Science Core Collection database and bibliometric data were obtained. Current issues regarding the concept of "milk production" were revealed with this study in order to contribute to the studies on milk production. The studies were examined in terms of the number of publications, publication types, reference analyses, country cooperation and common reference webs. According to the results of the analysis, the journals publishing the highest number of articles regarding "milk production" are respectively Journal of Dairy Science, Animals and Animal Production Science.
KEYWORDS: Bibliometry, publish, citation, sheep.

I. INTRODUCTION

Bibliometric analysis is a tool gradually increasing its importance in terms of the assesment and evaluation of the research impacts of authors, study groups or institutions (Pritchard, 1969a). Considering that the term "statistical bibliography" does not exactly define the research field and is confused with statistics, Pritchard suggested the use of the term "bibliometrics" in the analysis of journals, books and scientific information sharing tools with mathematical and statistical methods (Pritchard, 1969b).

Bibliometrics means presenting the latest developments and research channels in a particular field of research (Wang et al. 2014). Bibliographic analysis means evaluating the prominent analyses and performance of journals, countries and institutions within the process of decision making regarding science (Van Nunen et al. 2017).

There are studies conducted in various fields regarding bibliometric analysis. Berkman (1987), in his analysis of Public Administration Journal, examined 269 articles published in Public Administration Journal between 1968-1977.

In one of these, Demirgil (2018) addressed the scientific concentration fields in the publications of Süleyman Demirel University with bibliometric analysis. He found that the fields in which Süleyman Demirel University is the strongest within the scope of citation indexes were Engineering and Health Sciences. As for the publications in the fields of Social Sciences and Fine Arts, he stated that there was a limited number of studies.

Another study was on supply chain and logistics management. 1776 issues in 47 journals of the Turkish National Academic Network and Information Center social sciences databases were reviewed and 34 articles were found. It was found that logistic centers were examined the most in the aforementioned journals (Suvacı, 2016).

Beşel and Yardımcıoğlu (2017) conducted the bibliometric analysis of the Journal of Finance. It was stated that the number of empirical studies in the field of finance have increased in recent years.

The aim of this study is to examine the studies published on milk production in 2019 using bibliometric analysis and to reveal the tendencies of recent years in this field.

II. MATERIAL AND METHODS

The data of this research consist of 423 studies on milk production published in 2019 and scanned in Web of Science database. Web of Science (WOS) database enables accessing the citation statistics of scientific publications and the bibliographic data of publications (Meho and Yang, 2007). The publication types, author names, author countries, number of citations and how many times they were cited and the information of references in Web of Science scanning regarding 423 studies published in the field of "milk production" in Web

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of Science Core Collection database were found. A social network analysis was conducted on poultry farming with common reference networks. This analysis was carried out by being loaded in a format that complies with the R program.

Bibliometrics are concerned with studying relations between 'cited' and 'citing' literature. Garfield (1972) is greatly credited with pioneering the use of bibliometrics with his Science Citation Index (SCI), which make possibled the systematic quantitative analysis of scientific literature. The range of bibliometric techniques include word frequency analysis, citation analysis, authorship analysis, co-citation analysis, coauthor analysis, co-word analysis and simple document counting, such as the number of publications by an author, research group or country.

Bibliometric analysis is also named as "a general process for science mapping, field analysis and visualization" (Chen, 2017). Analysis methods for science mapping enable discovering useful information from data, networks and maps (Cobo et al., 2012).

III. RESULTS AND DISCUSSION

Basic information regarding sheep breeding was presented in Table 1. 423 studies were published in total. These consist of 383 articles, 23 compilations, 15 bulletins, 1 book chapter and 1 data paper. The studies were written by 2277 authors in total, 6 of them having a single name and 2271 with multiple names.

Tablo 1. Main Information

Description	Results
Documents	423
Sources (Journals, Books, etc.)	189
Keywords Plus (ID)	1776
Author's Keywords (DE)	1463
Period	2019 - 2020
Average citations per documents	0.1064
Authors	2277
Author Appearances	2408
Authors of single-authored documents	6
Authors of multi-authored documents	2271
Single-authored documents	6
Documents per Author	0.186
Authors per Document	5.38
Co-Authors per Documents	5.69
Collaboration Index	5.45
Document types	
Article	383
Article; book chapter	1
Article; data paper	1
Article; proceedings paper	15
Review	23

The list of journals in which studies directly related to the subject were published are presented in Table 2. The journal in which the highest number of articles in the field of milk production is published is the Journal of Dairy Science with 87 articles. The journal Animals with 18 articles and the journal Animal Production Science with 14 articles are other important journals that broadcast. The graph of this is shown in Figure 1.

Table 2. Most relevant sources

Sources	Articles
Journal of Dairy Science	87
Animals	18
Animal Production Science	14
Lwt-Food Science And Technology	10
Asian-Australasian Journal Of Animal Sciences	8
Livestock Science	7
Semina-Ciencias Agrarias	7
Tropical Animal Health And Production	7
Scientific Reports	6
Annals Of Microbiology	5
Food Microbiology	5
Indian Journal Of Animal Sciences	5
International Dairy Journal	5
Iranian Journal Of Applied Animal Science	5
Microbial Pathogenesis	5
Acta Scientiae Veterinariae	4
British Food Journal	4
Frontiers In Microbiology	4
Journal Of Cleaner Production	4
Science Of The Total Environment	4
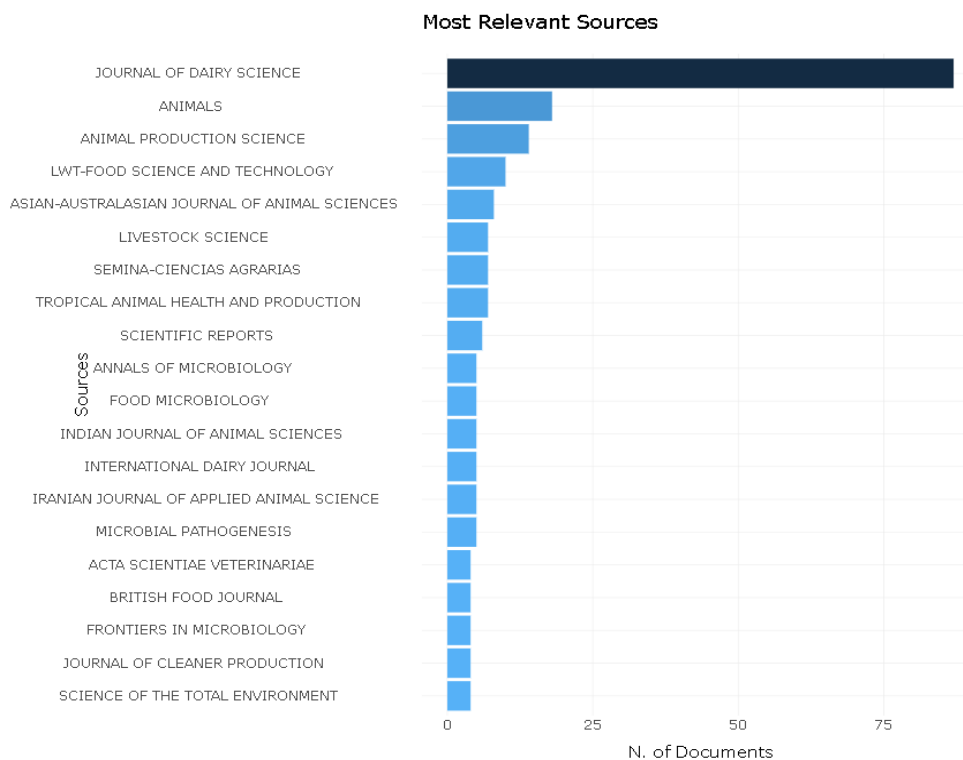
Figure 1. Most relevant sources

Nero LA, Roche JR and Devries TJ take the top places as the best authors. Information regarding other authors is presented in Figure 2.
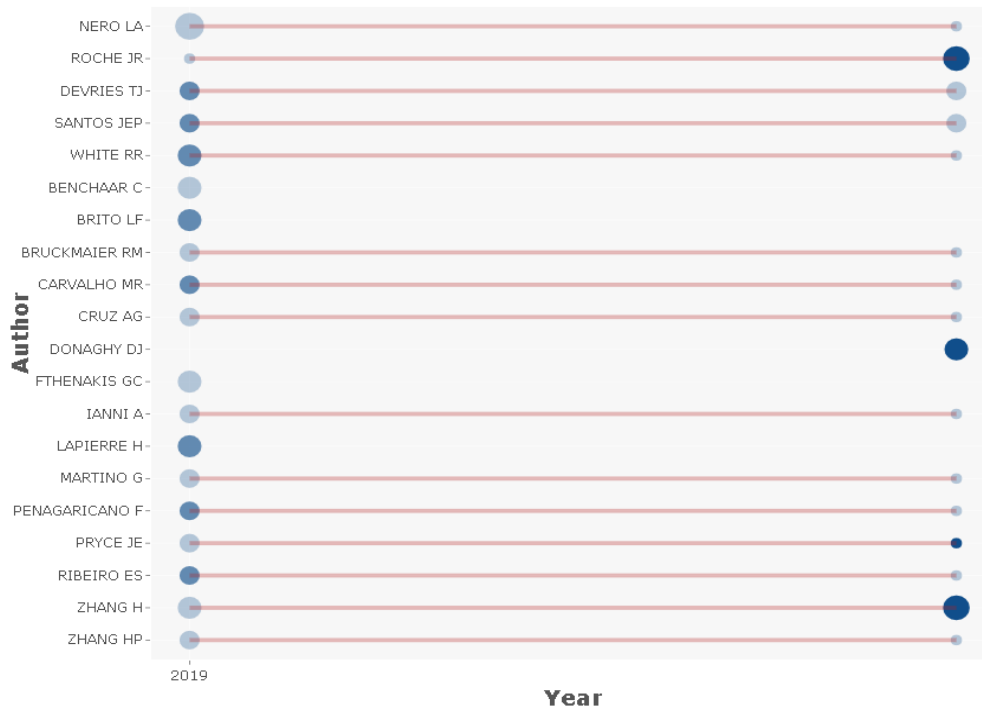
Top-Authors' Production over the Time

Figure 2. Author information

The mostly cited countries in publications are the USA (11), China (5), Canada (3), Germany (3), Iran (3) and United Kingdom respectively. The country with the highest number of citation average is Malaysia with 0.333 (Table 3 and Figure 3).

Table 3. Most cited countries number of citations

Country	Total Citations	Average Article Citations
USA	11	0.25
China	5	0.119
Canada	3	0.1765
Germany	3	0.2143
Iran	3	0.1667
United Kingdom	3	0.2308
Australia	2	0.1333
Brazil	2	0.0465
Ireland	2	0.1667
New Zealand	2	0.1538
Cameroon	1	1
Czech Republic	1	1
France	1	0.0909
Italy	1	0.0357
Malaysia	1	0.50
Poland	1	0.1429
Portugal	1	0.1667
Sweden	1	0.1111
Taiwan	1	0.3333

Most Cited Countries
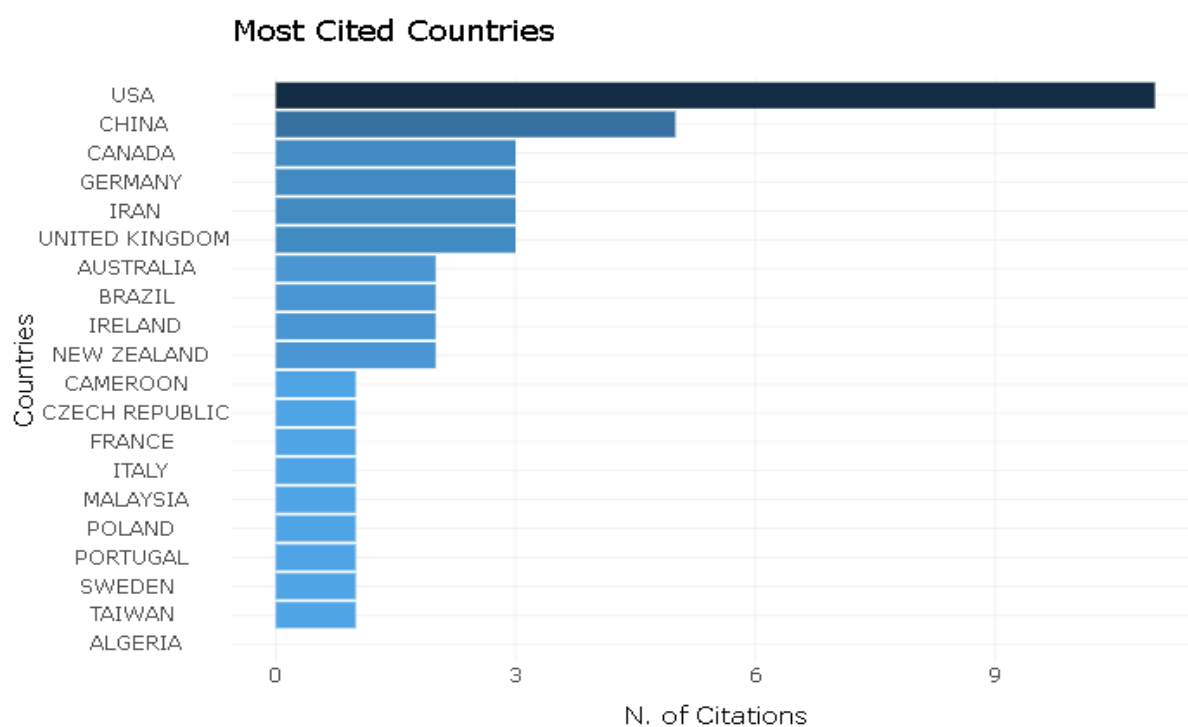
Figure 3. Most cited countries number of citations

The mostly cited publications are presented in Table 4 and Figure 4. The mostly cited resource in the studies on milk production is the article published in Clin. Rev. Allerg. Immu. Journal (n=3) by Heul AV in 2019. This publication's annual average number of citations is 1.5.

Table 4. Most cited documents of total citations

Paper	Total Citations	TC per Year
Heul AV, 2019, Clin Rev Allerg Immu.	3	1.5
Welsh JA, 2019, Public Health Nutr.	2	1
Wu LP, 2019, Environ Int.	2	1
Zinicola M, 2019, J Dairy SCI	2	1
Metz M, 2020, Food Microbiol.	1	1
Raveschot C, 2020, Food Chem	1	1
Tilocca B, 2020, J Proteomics	1	1
Mangwe MC, 2020, Anim Prod Sci	1	1
Hendriks SJ, 2020, Anim Prod Sci	1	1
Ho PN, 2020, Anim Prod Sci	1	1
Vieira Cp, 2020, Arab J Chem	1	1
Daros Rr, 2020, J Dairy Sci	1	1
Clay N, 2020, Ambio	1	1
Wei Y, 2020, Food Hydrocolloid	1	1
Tsai TW, 2019, Acs Catal	1	0.5
Hassan FU, 2019, Anim Nutr.	1	0.5
Liu WP, 2019, Jom-Us	1	0.5
Fleming AJ, 2019, J Dairy Sci	1	0.5
Charlton GL, 2019, J Dairy Sci	1	0.5
Carvalho MR, 2019, J Dairy Sci	1	0.5

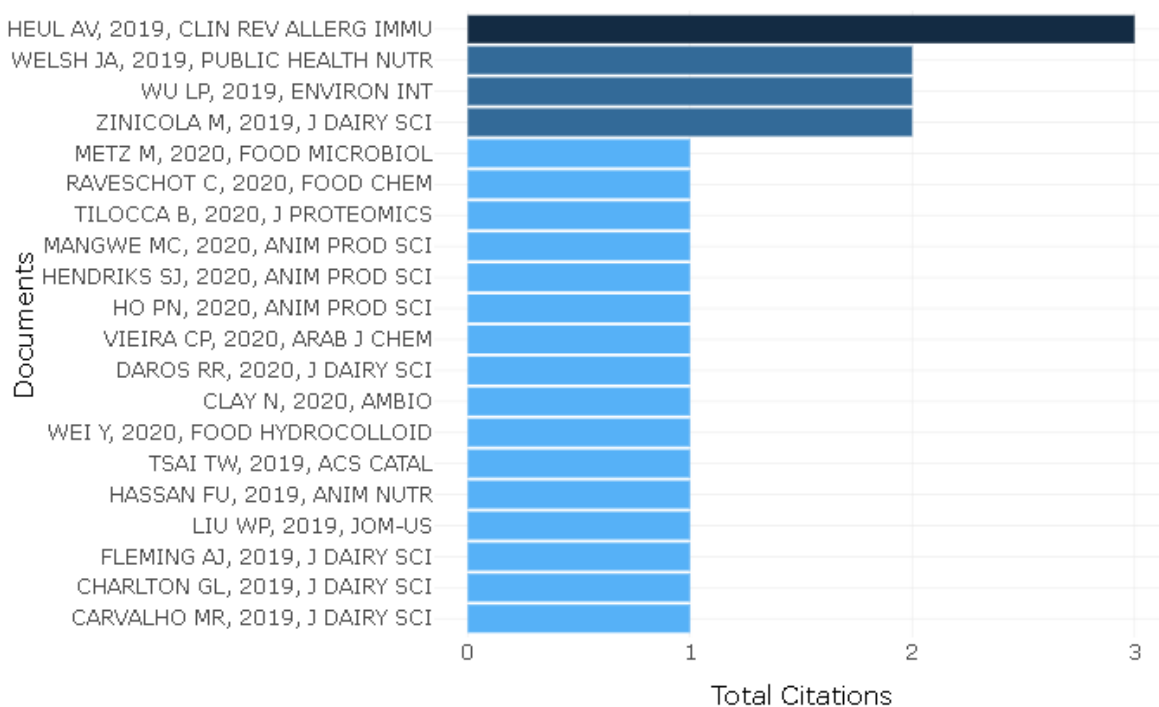|		
Laskowska E, 2019, Probiotics Antimicro	1	0.5
Hosseini F, 2019, J Food Sci Tech Mys	1	0.5
Lima MJR, 2019, J Food Meas Charact	1	0.5
Mohebbi-Fani M, 2019, Iran J Vet Res	1	0.5
Gholami-Yangije A, 2019, Vet Res Forum	1	0.5

Figure 4. Most cited documents of total citations

In Web of Science database, the countries where the corresponding authors mostly contribute to the issue themed "milk production" are the USA (44), Brazil (43), China (42), Italy (28) and Iran respectively (18). The other countries are also presented in Table 5 and Figure 5 in detail.

Table 5. Number of corresponding author's country documents

Country	Articles	Freq.	SCP	MCP	MCP Ratio
USA	44	0.10402	31	13	0.295
Brazil	43	0.10165	36	7	0.163
China	42	0.09929	32	10	0.238
Italy	28	0.06619	21	7	0.25
Iran	18	0.04255	12	6	0.333
Canada	17	0.04019	8	9	0.529
India	16	0.03783	14	2	0.125
Australia	15	0.03546	9	6	0.4
Germany	14	0.0331	7	7	0.5
New Zealand	13	0.03073	9	4	0.308
United Kingdom	13	0.03073	8	5	0.385
Ireland	12	0.02837	7	5	0.417
France	11	0.026	3	8	0.727

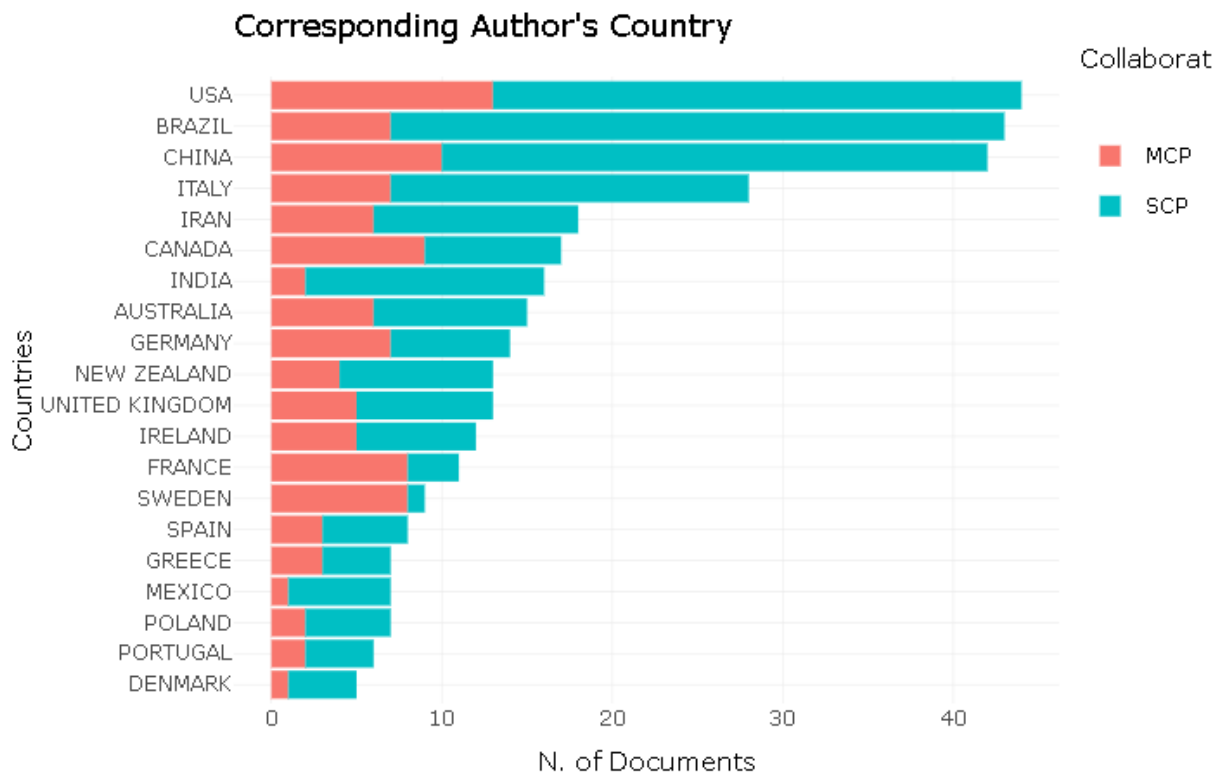| Sweden	9	0.02128	1	8	0.889
Spain	8	0.01891	5	3	0.375
Greece	7	0.01655	4	3	0.429
Mexico	7	0.01655	6	1	0.143
Poland	7	0.01655	5	2	0.286
Portugal	6	0.01418	4	2	0.333
Denmark	5	0.01182	4	1	0.2

Figure 5. Number of corresponding author's country documents

In Web of Science database, the examined fields in which the topic "sheep" was mostly studied in terms of research field were milk production (65), milk (43), dairy cows (36), cattle (35) and performance (35) respectively. These data are presented in Table 6 and Figure 6.

Table 6. Most relevant words occurrences and trend topics

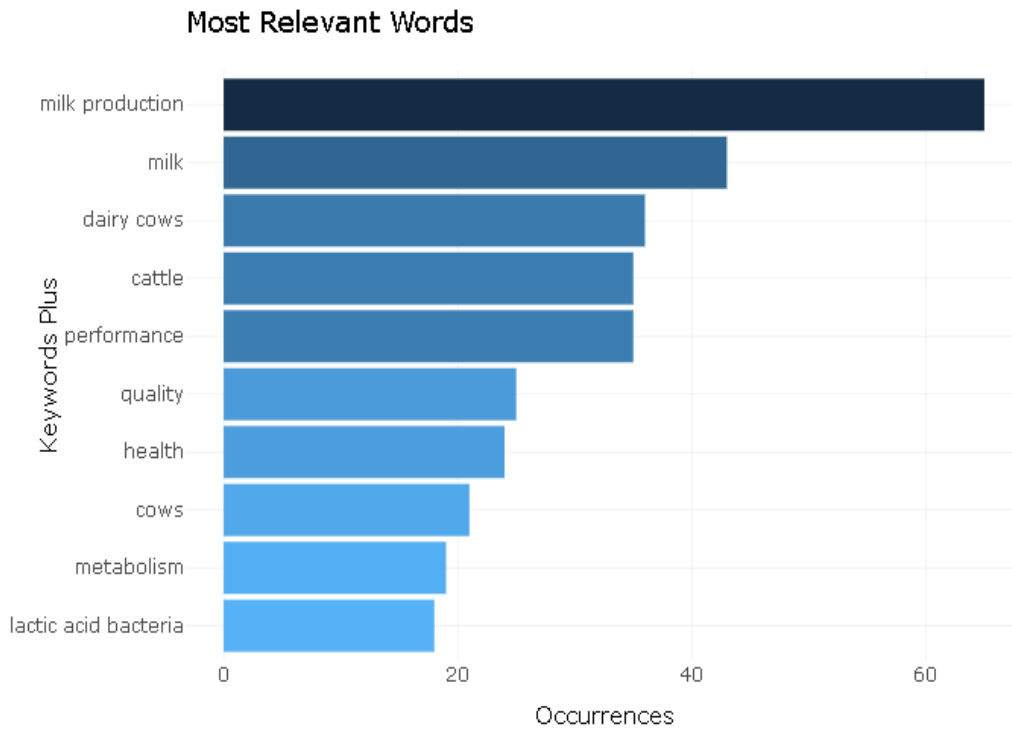| Terms	Frequency
Milk production	65
Milk	43
Dairy cows	36
Cattle	35
Performance	35
Quality	25
Health	24
Cows	21
Metabolism	19
Lactic acid bacteria	18

Figure 6. Most relevant words occurrences

The common formation network where important words are found related to the topic is presented in Figure 7.
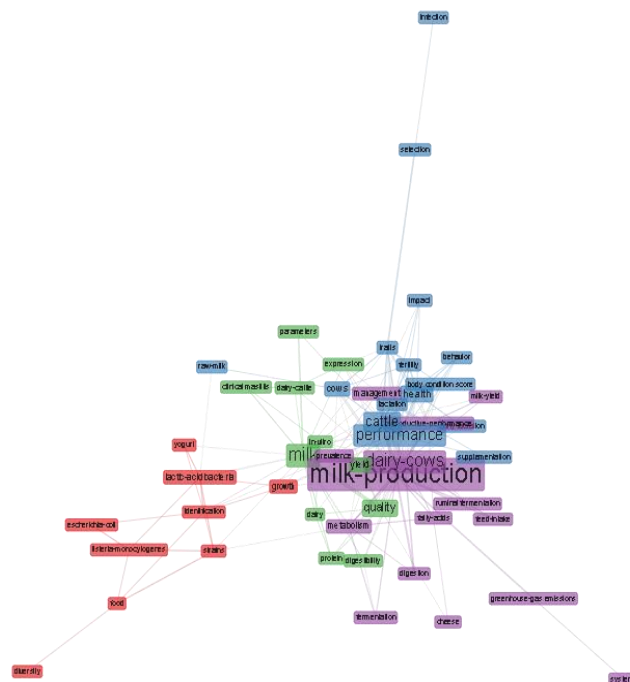

Figure 7. Co occurrence network

When the dendrogram regarding the accumulation of the topics was examined, it was found that the topics selection, traits and fertility were in a single cluster whereas other topics were in the other cluster (Figure 8). The map explaining the factors of the two clusters is presented in Figure 9 and the words at the forefront are presented in Figure 10.
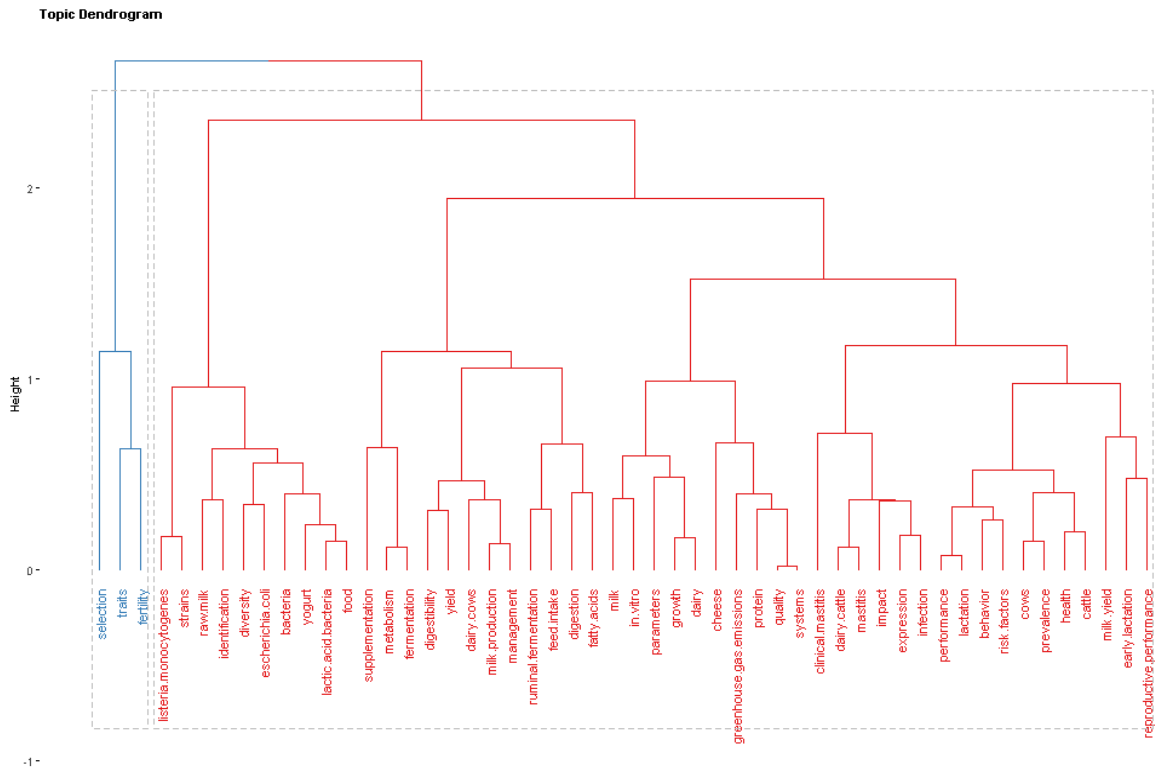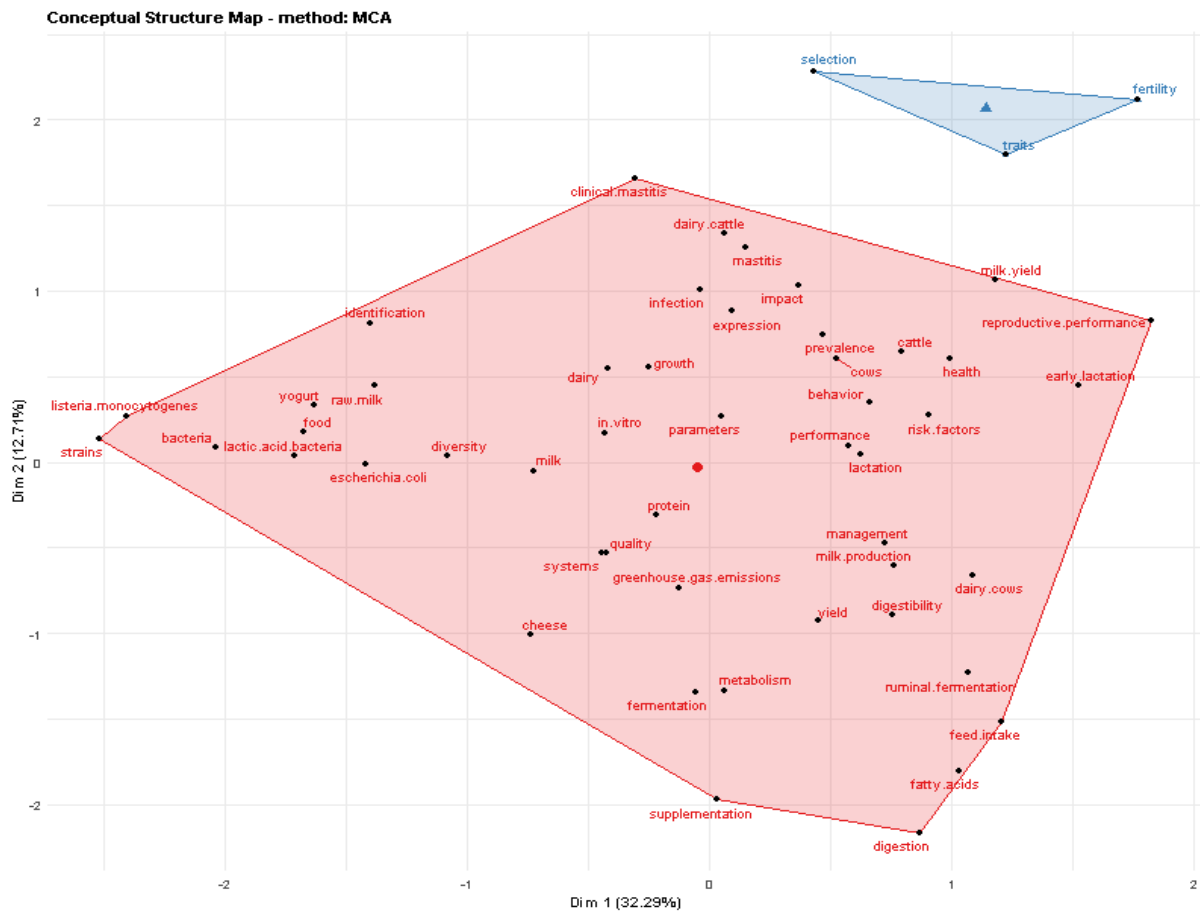
Figure 8. Topic dendrogram

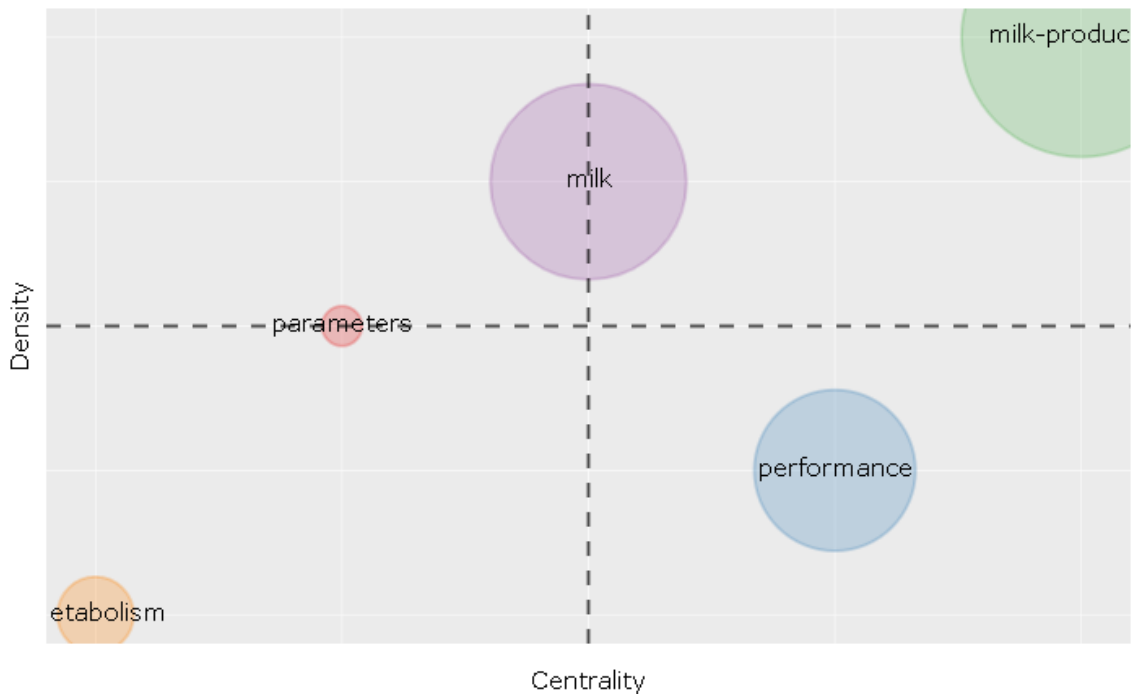**Figure 9.** Conceptual structure map.

Figure 10. Thematic map

The word tree map of the fields studies is presented in Figure 11. In the first column, the areas of milk production in big boxes, milk and dairy cows are at the forefront. Similar results are seen in Figure 12.
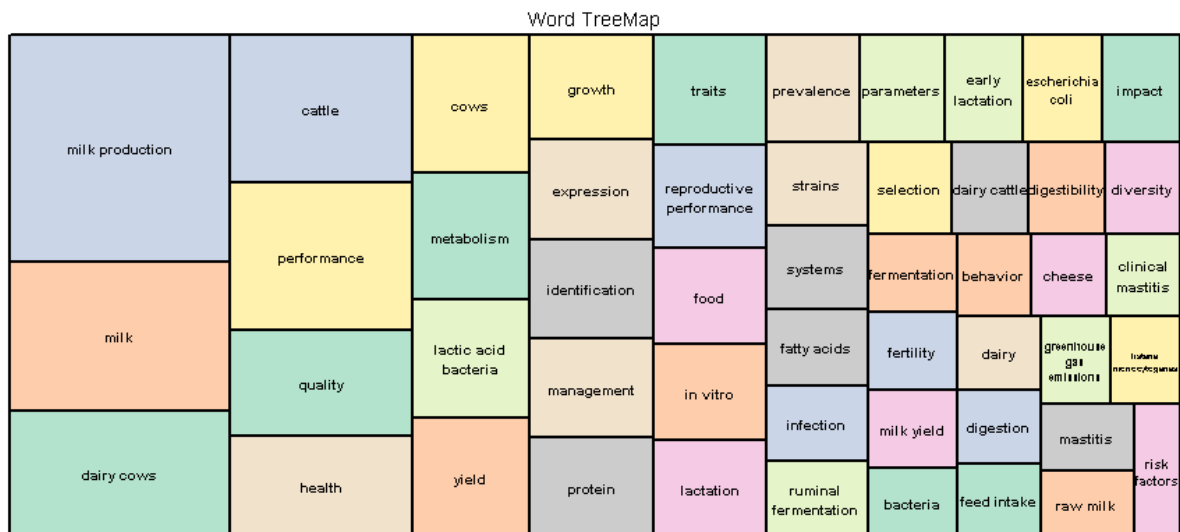

Figure 11. Word Tree Map

Figure 12. Word Cloud

The 423 studies on milk production published in 2019 consist of different types of publication such as article, bulletin and compilation. Regarding the publishing types which were highly published in the field of milk production, articles constitute the majority with a total ratio of 90.54 %.

In a bibliometric analysis conducted in the field of husbandry, 500 SCI-Expendant indexed studies scanned through Web of Sciences between the years 1992-2019 were found. The highest number of publications (70) was from 2014. The journal with the highest number of publications was Small Ruminant Research with 37 publications and the countries cited the most by the authors are the United Kingdom (8093), France (3176) and Australia (2689) (Çelik, 2020).

IV. CONCLUSION

The Journal of Dairy Science is the journal with the highest number of publications on milk production. It already validates this information with 87 articles in 2019.

The countries where the authors cited the most in the publications were the USA, China, Canada, Germany, Iran and United Kingdom respectively. The most crucial topics in terms of research fields are milk production, milk and performance respectively. In the light of this information, it is recommended that bibliometric studies should be applied in the field of husbandry.

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