Selcuk Journal of Agriculture and Food Sciences

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Research Article

(2023) 37(3), 608-617 DOI:10.15316/SJAFS.2023.058 e-ISSN: 2458-8377 Selcuk J Agr Food Sci

Bibliometric Analyzes of Some Major Effect Genes Associated with Meat Yield Traits in Livestock

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HIGHLIGHTS

- Bibliometric analysis is commonly used to guide decisions regarding research funding and the creation of research policies and offers scientists helpful information about research trends, patterns, and impact.
- This study presents a detailed bibliometric analysis of 4085 documents belonging to 464 different sources between 1981 and 2023 worldwide.
- The scientific community has recently been particularly interested in investigating some major effect genes associated with meat yield traits in livestock.

Abstract

Bibliometric analysis is commonly used to guide decisions regarding research funding and the creation of research policies and provides scientists with helpful information about research trends, patterns, and impact. Thus, researchers can track collaborators in this subject and find prospective scientific alliances. Additionally, researchers can develop new research themes by constantly monitoring the most recent trend study topics in this area. Therefore, we performed a comprehensive bibliometric analysis of 4085 documents scanned in the Web of Science (WoS) database on some major effect genes associated with meat yield traits in livestock between 1981 and 2023. The analysis shows that interest in this topic has recently grown. The fact that numerous scholars participated in the investigations, which major research groups conducted, demonstrates the growth of this field's collaborative working culture. The publication of studies in this field in high-impact journals such as Meat Science, Journal of Animal Science, and Animal Genetics reveals the scientific impact of this field. Keywords used in studies in this field are generally related to investigating the genetic factors affecting livestock's growth, muscle development, and meat quality characteristics. In country-based studies, China and the United States have the most studies in this field. The citation records of articles reveal the significant impact of this field in literature. The scientific community has recently been particularly interested in investigating some major effect genes associated with meat yield traits in livestock.

Keywords: Bibliometrics; Livestock; Myostatin; Calpastatin; Meat Yield; Meat Traits

Citation: Altay Y, Kaplan S (2023). Bibliometric Analyzes of Some Major Effect Genes Associated with Meat Yield Traits in Livestock. *Selcuk Journal of Agriculture and Food Sciences*, 37(3), 608-617. https://doi.org/10. 15316/SJAFS.2023.058

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Received date: 26/05/2023

Accepted date: 03/08/2023

1. Introduction

The livestock industry is a global industry that has been meeting the animal protein needs of human beings for many years (Meissner et al., 2013; Sohaib and Jamil, 2017). However, increasing meat yield per animal is becoming essential to meet the animal protein demand (Herrero and Thornton, 2013; Rauw et al., 2020). Meat refers to an animal's consumable parts used for food (Boler and Woerner, 2017). Meat is one of the valuable food sources for humans. It contains proteins, vitamins, and minerals necessary for the growth and development of the human body (Baltic and Boskovic, 2015; Pereira and Vicente, 2013). The main component of meat is proteins, which are responsible for tissue growth and repair (Singh and Bharti, 2021). In this regard, meat contains essential amino acids for the human body (Amirkhanov et al., 2017; Samicho et al., 2013). Meat also includes significant amounts of B vitamins and minerals such as copper, manganese, phosphorus, and iron (Strazdiņa et al., 2013).

Today, meat yield and quality are the key factors consumers consider before purchasing meat products (Resurreccion, 2004; Testa et al., 2021). Meat yield is the live weight ratio to the processed carcass weight (Motoyama et al., 2016). Therefore, meat yield strongly correlates with livestock system efficiency (Capper, 2013; Pethick et al., 2021). Meat yield is a complex trait, and various genetic and environmental factors affect this trait (Filipčík et al., 2020; Grosso et al., 2010). In this respect, genetic factors significantly affect livestock meat yield (Burrow et al., 2001; Case et al., 2010). However, meat yield is a quantitative trait that emerges with the common effects of polygenes (Hagen et al., 2005; Wang et al., 2022). Therefore, identifying the functional genes related to meat yield can increase yield per animal and contribute to the sustainability of the livestock industry (Gibbs et al., 2009; Gura, 2007).

To date, many significant genetic markers related to meat yield have been identified by Genome-wide association studies (GWASs) (Raza et al., 2020; Song et al., 2016). Myostatin is one of the most significant genetic markers associated with livestock muscle development (Aiello et al., 2018; Bellinge et al., 2005). Myostatin negatively regulates muscle growth (Amthor et al., 2002; Thomas et al., 2000). Moreover, mutations in the myostatin gene increase muscle mass and meat yield (Aiello et al., 2018; Bellinge et al., 2005). However, IGF1 (insulin-like growth factor 1), MYOD1 (myogenic differentiation 1), LEP (leptin), CAST (calpastatin), CAPN1 (calpain 1), FABP4 (Fatty acid binding protein 4), GHR (growth hormone receptor), SCD (stearoyl-CoA desaturase), and PPAR-γ (Peroxisome proliferator-activated receptor gamma) are other important genetic markers related to meat yield traits in livestock (Boucher et al., 2006; Mwangi et al., 2022; Özşensoy and Kara, 2019; Ramiah et al., 2016; Raziye, 2019; Sato et al., 2012; Telegina et al., 2018; Yan et al., 2018; Zhang et al., 2012).

Recently, bibliometric analysis has become very popular in scientific research (Merigó and Yang, 2017). Today, bibliometric analysis is a powerful tool for evaluating the valuable insights from scientific publications (Coimbra et al., 2019; Muhuri et al., 2018; Sweileh, 2020). Although it has many varieties, it generally provides detailed information such as publication year, citation, and collaboration numbers, as well as the scientific journals in which studies were published, journal impact factors, and other related information (Mishra et al., 2018; Thanuskodi, 2010). In this study, we have performed a comprehensive bibliometric analysis to highlight studies about some significant effects of genes associated with meat yield traits in livestock.

2. Materials and Methods

This study obtained 4,085 documents related to the use of major genes in meat yield and quality, indexed in the Web of Science (WoS) database between 1981 and 2023 as of April 1, 2023 (Table 1). To access the target studies related to the subject in the Web of Science database, both keywords and journals were carefully selected as criteria. Subsequently, the data related to the subject were downloaded from the Web of Science

(WoS) database system in plain text format and then organized using the "convert2pdf" package in the R software (R Core Team, 2016).

Table 1. Document structure of primary data

Document Types	**n**
Article	3668
Book Chapter	32
Data Paper	7
Early Access	25
Proceedings Paper	101
Publication with Expression of Concern	1
Correction	3
Addition (Correction)	1
Editorial Material	24
Book Chapter (Editorial Material)	1
Meeting Abstract	6
Note	11
Proceedings Paper	47
Review	156
Book chapter review)	1
Early access (review)	1

Bibliometrics is a quantitative analysis method used to explore the social network of scientific research (Onder and Tırınk, 2022). By leveraging quantitative data, this method facilitates the identification of historical trends in scientific studies and potential research subject areas in the future. It is examined through various aspects, including word frequency, co-citation, co-authorship, shared keywords, and the number of institutions or countries involved in the research (Çelik Ş., 2020). In this context, bibliometric analysis was conducted using the shiny application of the 'bibliometrix' package in R software (Aria and Cuccurullo, 2017).

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3. Results and Discussion

The primary data shows that articles are the most common document type among the 4,085 documents. It can be observed that the second most common document types after articles are Reviews and Proceedings Papers, numbering 156 and 101, respectively. Moreover, the remaining document types make up a small percentage of the total documents. According to the comprehensive bibliometric data analysis of the actual data, the analyses reveal a consistent increase in published articles related to major effect genes associated with meat yield traits in livestock between 1981 and 2023. The increase in the number of articles can be traced back to 1980, with a peak occurring in 2000. There was another noticeable surge in the number of articles between 2000 and 2010, followed by a peak again in 2010. It is also evident that the increase in the number of articles has continued from 2010 to 2023. The annual distribution of published articles is presented in Figure 1.

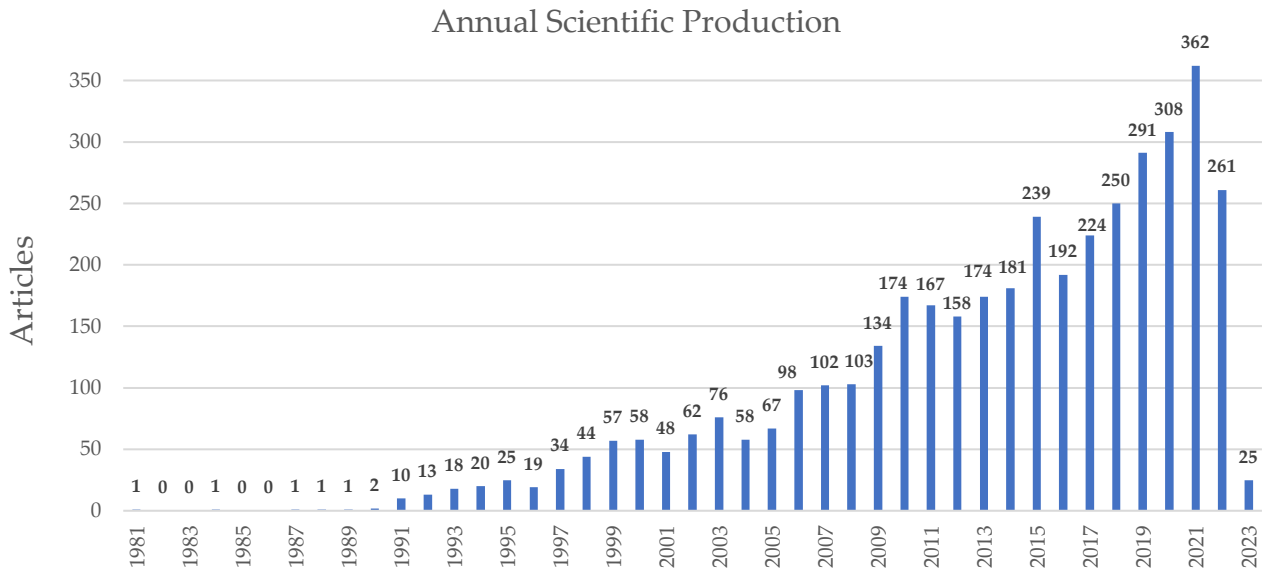

Figure 1. Published articles by year

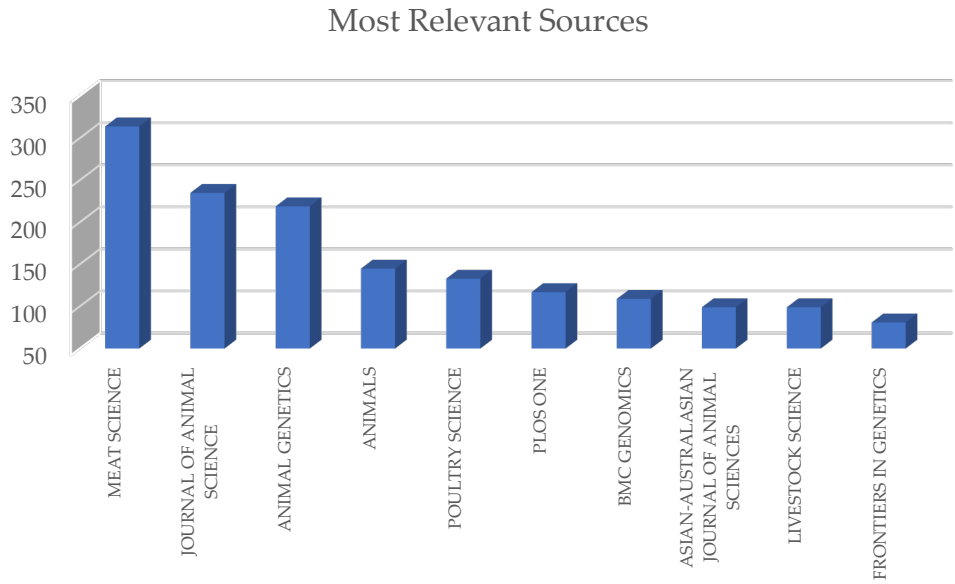

Figure 2. The journal sources of published articles

Figure 2 shows the journal sources of published articles in this field. First, it can be observed that the journal with the most articles published is 'Meat Science,' with 314 articles. Following that, it was determined that the most published journals were the 'Journal of Animal Science,' with 235 articles, and 'Animal Genetics,' with 219 articles. Notably, the publications in this field are included in the most impactful journals in the field of Animal Science.

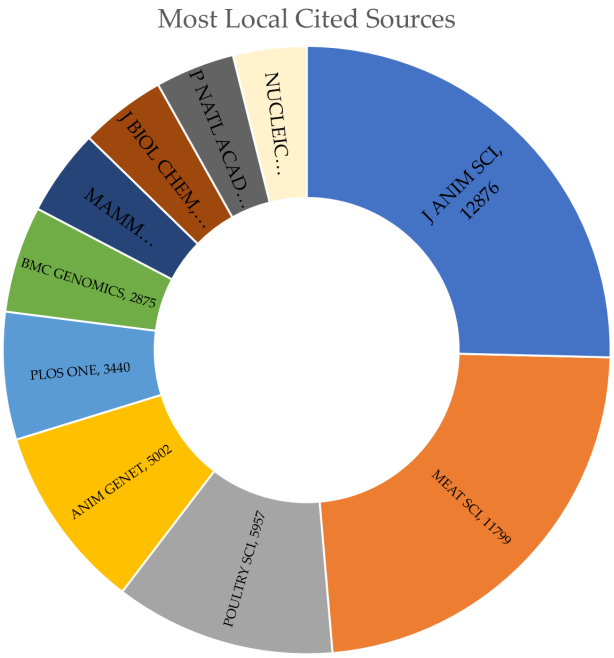

Figure 3. The most locally cited journals

The most locally cited journals are given in Figure 3. The Journal of Animal Science and Meat Science occupy the top two positions among the cited journals. Considering all cited journals, essential clues are obtained regarding the scientific impact of the publications in this field.

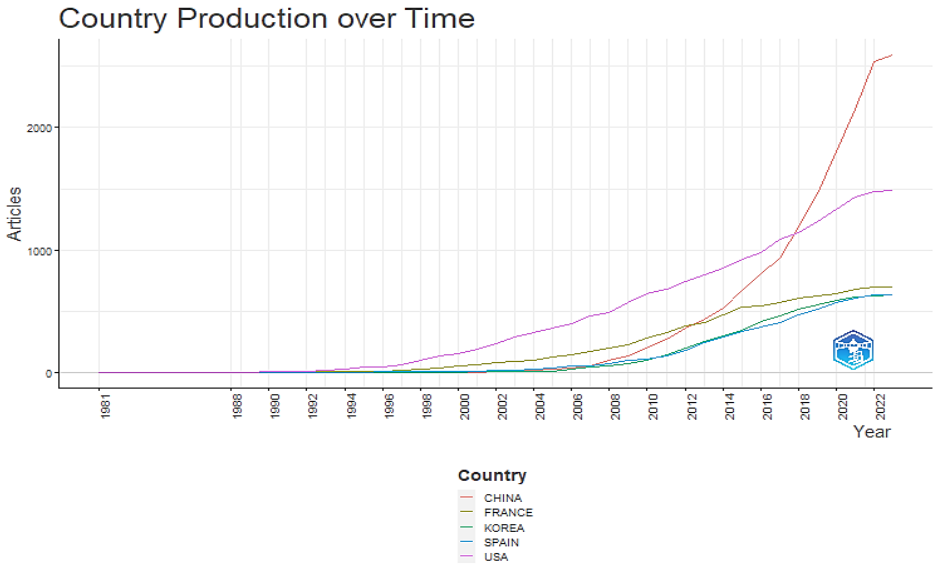

Figure 4. Country production by year

Figure 4 provides information about country-based production between 1981 and 2022. Considering country-based production, the highest production is in China and the United States; France, Spain, and Korea follow it. It is also seen that the studies conducted in China have increased rapidly, especially in recent years. The fact that country-based production continues to increase over the years reveals that studies in this field are a trend.

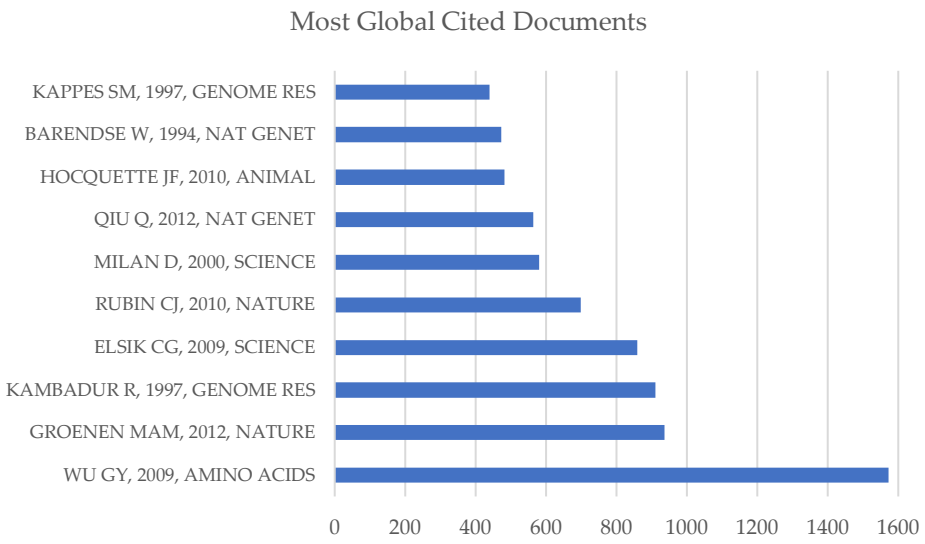

Figure 5. Globally most cited publications

The most cited studies worldwide are given in Figure 5. When the ten most cited studies in this field are evaluated, it is seen that 7516 citations have been made to these studies. Among these studies, the first four most cited studies are Wu GY, 2009, The Journal of Amino Acids (1573), Groaenen Mam, 2012, the Journal of Nature (936), Kambadur R, 1997, The Journal of Genome Research (936) and Elsık Cg, 2009, The Journal of SCIENCE (859).

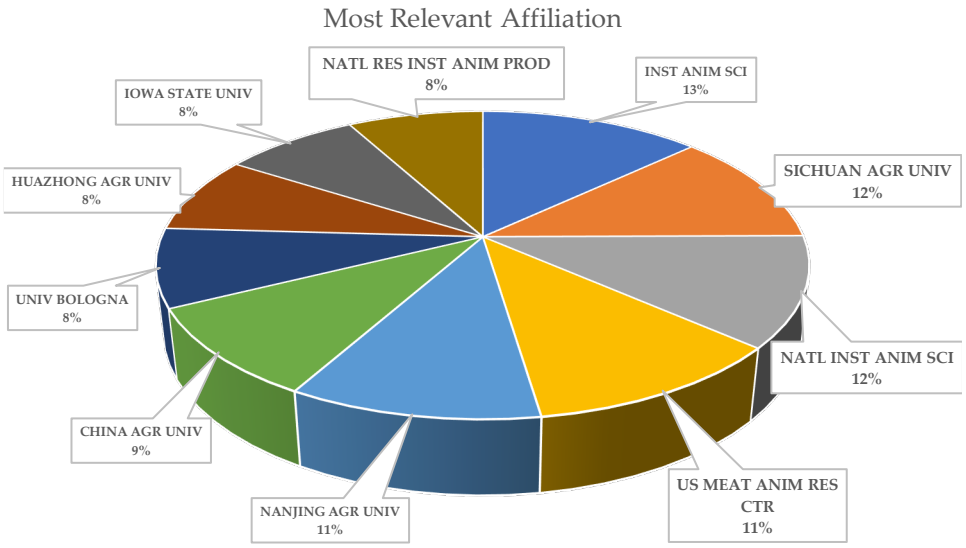

Figure 6. Most relevant affiliations

The ten educational institutions that have published the most scientific articles are depicted in Figure 6. The Institute of Animal Science ranks first among educational institutions, with 165 articles produced. Following this institution, Sichuan Agricultural University (149), National Institute of Animal Science (146), US Meat Animal Research Center (141), and Nanjing Agricultural University (133) are among the educational institutions with the highest number of articles. When evaluating educational institutions, it becomes evident

that institutions in China and the USA occupy the top positions as the most prolific article producers.

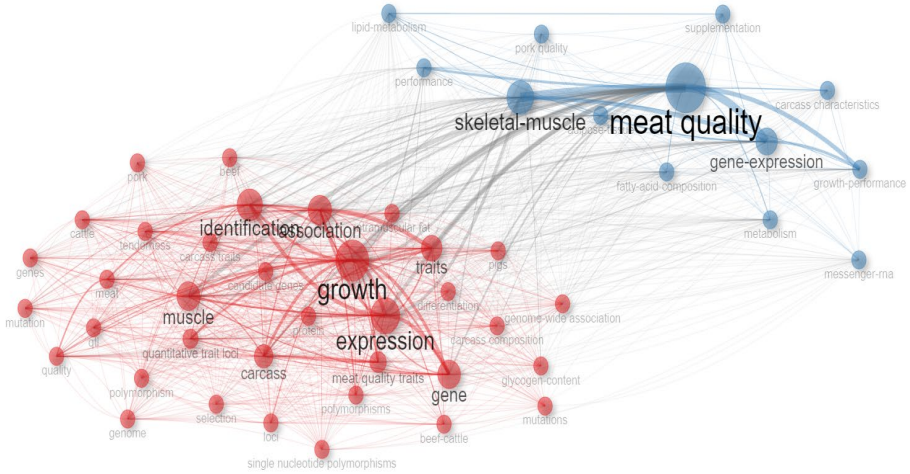

Figure 7. The closeness of trend topic keywords

The closeness of the trend topic keywords used in the studies is illustrated in Figure 7. When evaluating the keywords employed in this study field, it is apparent that they fall into two distinct groups. In the first group, keywords such as "expression," "growth," "muscle," "identification," "association," and "gene" are closely related to one another in terms of their connections. The central keyword in this group is "growth," which exhibits a typical relationship with all the other keywords. In the second group, keywords like "meat quality," "skeletal muscle," and "gene expression" have "meat quality" at their center, and these keywords are relatively less connected to the keywords in the first group. When considering both groups, it can be concluded that they are related to articles investigating the genetic factors influencing the growth, muscle development, and meat quality characteristics of livestock.

4. Conclusions

Bibliometric analysis provides valuable information to scientists about research trends, patterns, and impact, and it is frequently used to inform decisions regarding research funding and the development of research policies (Akhavan et al., 2016; Zahra et al., 2021). Therefore, this study presents a detailed bibliometric analysis of 4,085 documents from 464 different sources, including journals and articles, published worldwide between 1981 and 2023. Consequently, this study serves as a vital research resource encompassing all aspects of work conducted in the field of animal science up to this point. In this regard, researchers can identify potential scientific partnerships and stay updated on colleagues working in this field. Furthermore, researchers will also be able to identify new research topics by closely monitoring the latest trends in this field.

Author Contributions: The authors declare that they have equally contributed to the article. All authors reviewed and approved final version of the manuscript.

Funding: This research received no external funding

Data Availability Statement: The data were accessed from the Web of Science (WoS) database on 01.04.2023 using the keywords "gene" and "meat quality traits". The data of this study in the field of animal husbandry will be provided by the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest

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