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Current Challenges and Opportunities for Circular Economy in the Beauty Industry. A Bibliometric Analysis

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Abstract. *The beauty industry contributes not only to the pollution of the environment, because of the improper disposal of packaging, but to the users' health as well, due to the harmful ingredients, which are used to mass-produce beauty and personal care products. Although sustainability has become an imperative worldwide, this industry still fails to adhere to such norms if we pay attention to the large volumes of plastic and the exaggerated impulse to buy without actually needing, which is a behavior driven by actual consumerism. This paper aims to disclose the current state of research in the academic field of circular economy in the beauty industry, by investigating the contributing authors, organizations and countries and the networks created until now, as a stepping stone for future research. By performing a bibliometric analysis using the VOSviewer software, it was found out that the current literature is not very rich in publications on the integration of circular economy in the beauty sector, mainly because the topic started to be of interest in the recent years with the most productive publication year being 2022. Our research shows that authors from countries like India, China, Indonesia, Italy and the United States have contributed to the literature by touching topics revolving around sustainability in cosmetics and beauty products and innovations regarding a clean development of such products. However, the theme of circular economy in the creation of a clean and safe beauty industry still needs attention from academics in order to fully attain sustainable development goals.*

Keywords: circular economy, beauty industry, sustainability, green packaging, green products, bibliometric analysis, VOSviewer

Introduction

Nowadays, for whatever need we have, be it psychological or physiological, there is always a solution due to the unimaginable high number of options in the market. However, the fast-paced evolution of the world and consumerism have led to many environmental issues that are slowly damaging our planet and our health altogether. As a consequence, the European Union introduced the European Green Deal in 2019 (European Commission, 2019) and the United Nations (United Nations, 2015) presented the 17 Sustainable Development Goals for creating a better world by not letting poor environmental choices result in poor health conditions for humans.

Similar to the well-known concept of fast fashion, which is ranked as the second biggest polluter and which is embraced by the majority of people, disregarding the harm it does to the planet, fast beauty is an emerging trend that is just as bad. It is a human drive to be beautiful and look attractive to the others around, but few are those who research the ingredients used in and for the beauty products. Not to mention the unbelievable amounts of waste generated by the plastic packaging which results from this industry.

Concepts of the circular economy can be applied to the beauty industry as well in order to tackle the ongoing environmental challenges the whole world is trying to fight against. By thorough research based on evidence from specialists, consumers can learn how to protect both themselves from destructive ingredients and the planet from the plastic and microplastic that most often remains overlooked in the beauty sector. Therefore, academic research plays just as a vital role in calling for

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awareness among both consumers on how they can make wise choices when purchasing beauty products and how they can further involve in the process of recycling and upcycling, and entrepreneurs too who embark on the journey of creating and delivering innovative sustainable beauty products.

This article follows a bibliometric analysis and the introduction builds the ground for the research questions and the general concepts presented in the literature review; afterwards, the methodology on data procurement is explained, while results are outlined in the next section; finally, the paper ends with discussions and conclusions.

The bibliometric analysis is based on the following research questions: (1) What are the main research trends and subjects touched in the academic literature on circular economy in the beauty industry? (2) What are the latest and most debatable topics in the beauty industry research? (3) What are the countries, institutions and authors most prevalent in the field of beauty industry research? (4) Who are the most cited authors in this area and which organizations and countries are most dominant in the beauty sector?

Literature review

General concepts on circular economy

Circular economy practically means to minimize waste as much as possible through sharing, reusing, repairing, recycling or upcycling existing objects or materials in order to extend the life cycle of some products with the scope of creating a potential future value for their usage. (European Parliament, 2023).

Resources are limited and many European and worldwide institutions have tried throughout the past years to find solutions for the environmental issues that are slowly degrading the planet and people's health. Due to the fact that most such issues are drawn from the economic activities, the concept of circular economy was introduced in the minds of policymakers and NGOs (Murray, Skene, & Haynes, 2017) so as to be encouraged among businesses and consumers in terms of the redesign and re-usage of materials in the daily products that we all depend on. Circular economy is most commonly known to be based on 3 or 7 pillars, depending on the source we choose to rely on. However, all these pillars basically refer to (OREE Association, 2015) value (which should be measured beyond the financial aspect), materials (which should be continually cycled in the economy to bring value), energy (which should be based on renewable and clean sources), water (which should be sourced in a sustainable way), biodiversity (which should be preserved and enhanced), society and culture (social governance and policymakers that tackle the environmental problems for the benefit of the society), health and wellbeing (which should be assured for humans and other species). In other words, this concept encompasses (Olabode, Sher, & Egbelakin, 2021) the idea of minimizing waste, keeping materials in circulation by recycling and upcycling and giving resources a long-term value for environmental purposes.

The beauty industry and its environmental implications. Trends and challenges.

By massively contributing to pollution and by being a major threat to the health of people, the beauty industry deals with many challenges, and opportunities likewise, to become eco-friendly (Benefit cosmetics LLC, 2023) and sustainable. It is a basic human need to take care of oneself and each one of us loves to look good and beautiful.

This is why so many beauty brands appeared and still appear on the market: to meet this intrinsic need to fit in a world that promotes beauty as a necessary social standard. (Mangal, Ray, Saha, Paul, & Maji, 2021) When talking about the beauty industry, all products are included, from basic hygiene care products to cosmetics, beauty treatments and dermatological products. It is

obviously normal and acceptable to use such products for personal care. Nonetheless, the beauty industry becomes a danger to biodiversity and humans when it stops being ethical and indulges in mass-production with the principal aim of generating money and overlooking the creation of value. Most people use beauty products, but few consider the toxic chemicals that end up in the seas and oceans and that harm bodies at some level, or the plastic and microplastic that are most often not reused and thrown away in garbage that contributes to the high levels of carbon footprint? The answer might sadly be 'almost never'. People tend to only care about the momentary happiness after buying a new body lotion, shampoo or the latest piece of make-up and are not completely aware of the environmental and health dangers that come as a consequence of indifference and lack of proper information on this topic.

What organizations and beauty companies must focus on, besides developing clean and safe products and coming up with eco-design for their packaging, is making consumers understand the importance of responsible consumption. Given the challenges from institutions, the green deal or the SDGs for instance, and the rapid evolution of technological advancements, beauty brands (Sparknews and Cosmoprof Worldwide Bologna, 2020) will need to reshape their business strategies and marketing practices in order to align with regulations regarding the circular economy and ethical and social norms. Because of greenwashing (Moodaley & Telukdarie, 2023), an unethical practice companies do, which concerns the false disclosure of information on ingredients, formulations and so on, consumers cannot entirely be sure of what they are purchasing, especially due to the fact that cosmetic formulations can be hard to understand for someone who is not in touch with chemistry notions. However, as technology remains a useful and handy help, many specialized apps have been launched with the purpose of assisting users in identifying the components of the products they use. Some examples are from Apple store (Apple, 2023): Yuka – Food & Cosmetic scanner, Think Dirty – Shop Clean, OnSkin – AI Product Scanner, Acne – Safe and the list may go on. The principle of these apps lies in the possibility of scanning the list of ingredients of a beauty product and being given a sort of analysis about which ones are harmful and which are good for the skin and health. In the dermato-cosmetics sector, the Bioderma brand is a European affordable and favorite skincare, known for its expert approach and transparency when it comes to its formulations, due to NAOS (NAOS, 2024), its platform where most of the ingredients are openly explained and decodified.

Sustainable packaging innovations

Beauty products are typically stored in plastic or aluminum packages, and both can be recycled and reused. Beauty packaging can be more complex because beauty products need special conditions to be preserved. Packaging accounts for approximately 40% of the global usage of plastic (Ding & Zhu, 2023) and plastic waste management has dramatically become a challenge for many industries in the world. Thus, to tackle the plastic waste, recycling and reusing can lead to a 'closed-loop circulation' that encourages eco-design and production first, then consumption, collection and recycling that contribute to the creation of new raw materials, where possible. For one-time use products, brands can opt for replacing the plastic with biodegradable (or compostable, depending on possibilities) cans, while for long-term use products refilling may become an environmentally friendly solution, if the package is design to last and is easy and enjoyable to be reused by creating a pack that users will not want to throw away. (Qian, et al., 2022)

It is considered (Beurteaux, 2023) that local independent smaller brands are more open to innovate with sustainable packaging, although they may lack the financial resources for such an investment, and younger customers are more prone to recycle and upcycle by choosing to refill

some of their favorite products at a lower price than the original ones. In parallel, recycling also has benefits that surpass the environment benefits a bit in terms of adding to the economic development of countries, because not only do costs decrease, but the post-consumer materials can be transformed into raw materials in the industry. (Douglass, 2023)

Consumers' awareness is extremely vital and beauty companies must ensure they follow regulations applied in different regions regarding the sustainable development, production and packaging of their products. The topic of beauty industry in relation with circular economy is still under-researched and it determined academic scholars to dive deeper into the social and environmental issues generated by beauty companies' practices and consumers' lack of knowledge on what they use on a day-to-day basis. The beauty sector will continue to be challenged by external drivers and it will strongly remain chained to environmental and health aspects. Nonetheless, future research and development techniques could be introduced by beauty brands for a sustainable supply of beauty products in the market and not only younger generations, but the elderly as well will become more selective when acquiring hygiene and beauty goods.

Methodology

In order to provide an answer for the before-mentioned four research questions in the introduction, we chose to conduct a bibliometric analysis as a quantitative research method for our paper, by looking into bibliographic data. We relied on Scopus, launched by Elsevier, as the chosen database due to the quality writings it covers in well-known journals in academia. (Baas, Schotten, Plume, Côté, & Karimi, 2020) A bibliometric analysis performs networks between authors, citations, organizations and countries and identifies clusters of keywords that predict the subjects of papers, in order to discover the current level of research in a chosen area of study. (Ellegaard, 2018)

We performed the search in February 2024 and used the keyword mix 'sustainable', 'circular', 'green' 'beauty industry' and 'beauty products', choosing only the 'Article title, Abstract, Keywords' type of paper and not taking into account the time range. The subject area was limited to the following domains: 'Environmental Science', 'Social Sciences', 'Business, Management and Accounting', 'Biochemistry, Genetics and Molecular Biology' and 'Economics, Econometrics and Finance', so that we could analyze only the papers strictly related to the sustainability and circular economy in the beauty industry field. After sorting out the titles that did not match our interest, 118 articles (n=118) were suitable for this research. They were exported into a csv file including cited references and full record with the scope of introducing them to VOSviewer. This software was used to process the data further by creating graphical networks between the bibliographic and text data. Considering what has been published until now, we could not find any similar bibliometric analysis on the topic of circular economy in the beauty industry. Thus, we want to emphasize the fact that this topic is quite new in academic research, stemming back to the years 2018-2019, with a prevalence of articles published in 2022 and 2023. This is also the reason why the number of articles analyzed in our research is low. Moreover, by trying a similar combination of words in a different database, i.e., Web of Science, even fewer documents would have been available for our study, and this is why the Scopus database remained a pillar in this paper. There is still time for researchers in different fields to embark on the journey of conducting research on how the beauty industry has the potential to become green and sustainable and how consumers should become aware of their consumption behavior towards beauty and personal care products in relation to their health and well-being in a cleaner environment. The poor literature regarding the green beauty industry is an indicator for academics to pay further attention to this niche field of study as it can bring many benefits to beauty companies which desire to promote

healthy products through sustainable product development, to beauty entrepreneurs who wish to stay competitive and in business through creating clean formulations for their products, to consumers who are exposed to risks associated with bad ingredients and, finally, to the environment which suffers from the huge quantities of plastic and microplastic in the packaging. Thus, future connections between researchers in the field can be created by gathering together professionals from different areas of study such as economy, chemistry, biology, bioengineering, and many others related to the sustainable development of beauty and personal care products.

Results and discussions

As mentioned in the previous section, the topic of circular economy in the beauty industry started to gain importance from the public in recent years and it is still a brand-new domain that offers multiple research possibilities for academics. The beauty industry became a hot topic with the hit of the pandemic worldwide in 2019 (7 papers), when many digital influencers started to promote skincare routines and make-up techniques on Tik Tok and Instagram platforms and consumers responded to the influence of social media. (Santy & Andriani, 2023) Simultaneously, with the increased interest in sustainability and green production and consumption promoted by institutions and big companies, users started to pay more attention to the personal care products, cosmetics and make-up they use, an interest generated by health incentives and environmental concerns. The year 2020 (14 papers) marked the beginning of a rise in the number of articles published, followed by years 2021 (16 papers) to 2023 (25 papers) with an annual increase in the numbers (Figure 1). The chosen database from Scopus shows that 2024 has already begun with two articles, but, as it is just the beginning of the year, a significantly higher number of articles on circular and green economy in the beauty industry should be expected. The number of publications per year demonstrates that the topic is new and still lacks involvement from the research field. Nonetheless, as sustainability will take over most of the society's development aspects, and with the imposing of regulations and laws regarding the green and clean production of beauty and personal care goods, research will inevitably become a must and more journal articles will be published on this topic.

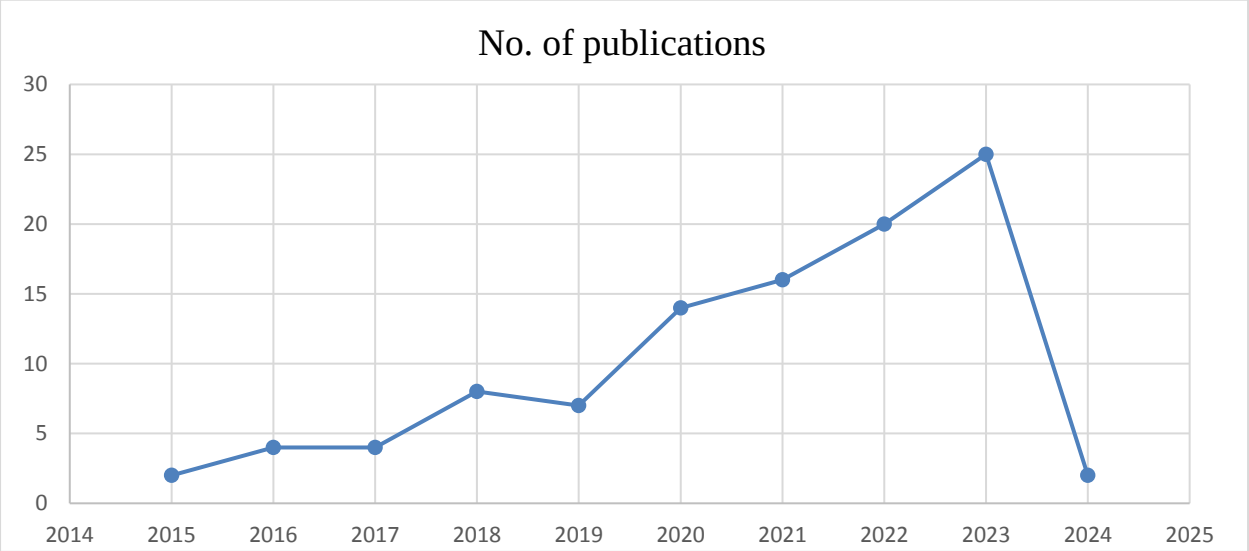

Figure 1. No. of publications per year

Source: Authors' own research.

In Vosviewer software, we analyzed what the most important topics and research trends were touched in the previous academic literature and we found out (Figure 2 and Figure 3) that sustainability was a topic of interest for researchers. The most common keywords used in the articles are: "cosmetics" (15 occurrences), "sustainability" (14 occurrences), "beauty products" (10 occurrences), "purchase intention" (10 occurrences), "sustainable development" (8 occurrences), "cosmeceuticals" (6 occurrences), "skin care" (6 occurrences), "consumer behavior" (5 occurrences), "product design" (5 occurrences). Besides the green and sustainable characteristic of a beauty product, the available literature mentions the importance of consumers' awareness in terms of their purchase intention. So, an understanding of the whole green concept applied in the beauty products is imperative, because if consumers change their purchasing attitude towards beauty and personal care products, companies automatically need to change their business practices to align with the beliefs and values of their customers.

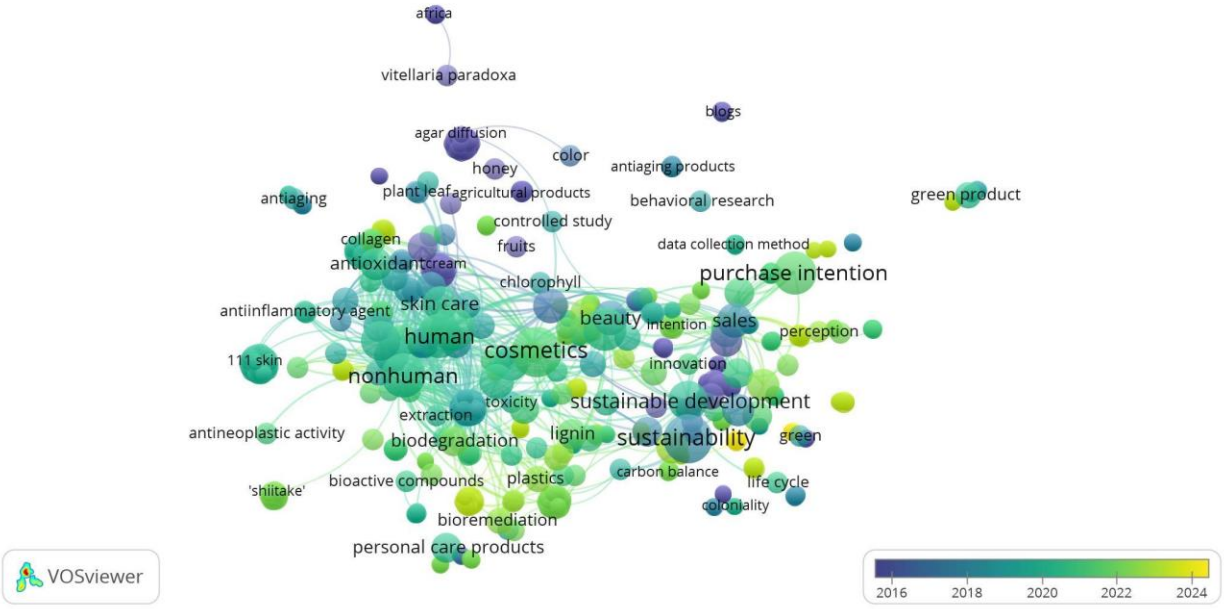

Figure 2. Keyword co-occurrence in overlay visualization

Source: Authors' own research.

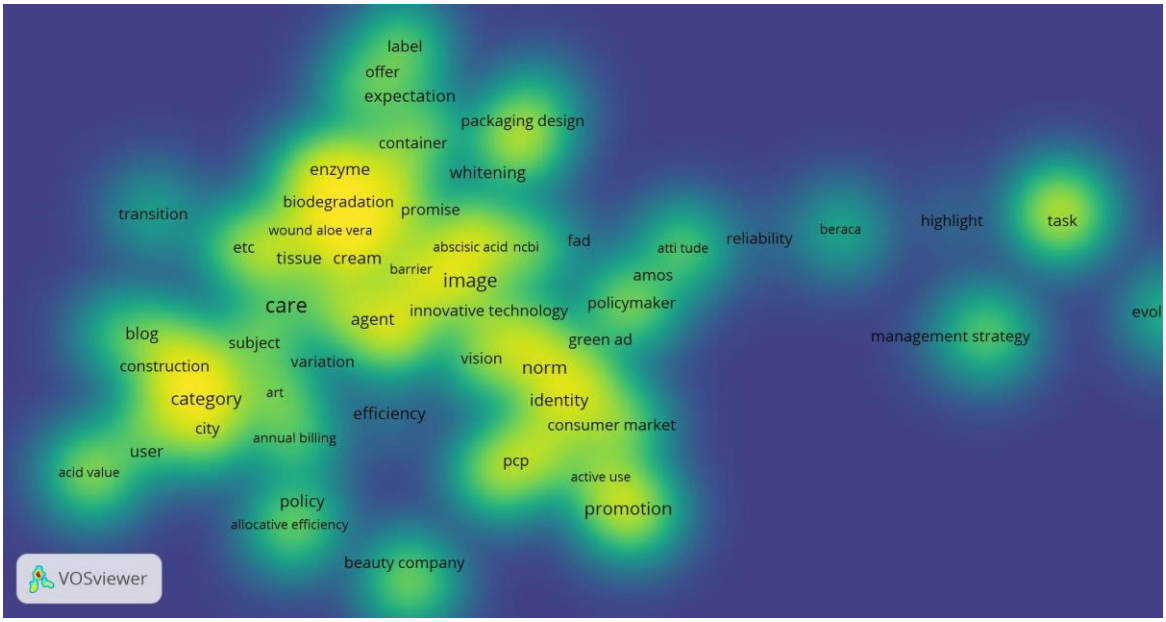

Figure 3. Term occurrence in density visualization

Source: Authors' own research.

The keyword and term occurrence networks in VOSviewer, using the option of a query based on text data to create a network from title and abstract field with full counting, answer to the first research question of this study regarding the research trends and subjects touched in the academic literature until now. As the beauty industry includes more areas of study, we also wanted to analyze from which categories of subjects the most debatable topics arise. Table 1 shows how environmental and social sciences merge with biochemistry, genetics, molecular biology, pharmaceutics, chemical engineering, economics, medicine and agricultural and biological sciences. For an issue to be successfully solved, there is a need for professionals from divergent areas to collaborate and contribute to quality research, because diversity engages more valuable points of view that can help build up a relevant and reliable source of accurate information.

Subject area	No. of publications	Subject area	No. of publications
Environmental Science	43	Engineering	15
Business, Management and Accounting	38	Energy	14
Social Sciences	35	Medicine	14
Biochemistry, Genetics and Molecular Biology	30	Chemistry	11
Pharmacology, Toxicology and Pharmaceutics	18	Computer Science	11
Chemical Engineering	17	Agricultural and Biological Sciences	10
Economics, Econometrics and Finance	16	Health Professions	2

*Source:*Authors' own research.

The authors who contributed the most to the literature for the circular economy in the beauty industry are shown in *Figure 4*. The most productive author – P. Morganti – is also the most cited one with 113 citations as per the below co-citation – cited authors network in density visualization in VOSviewer. (*Figure 5*).

Table 1. Subject category

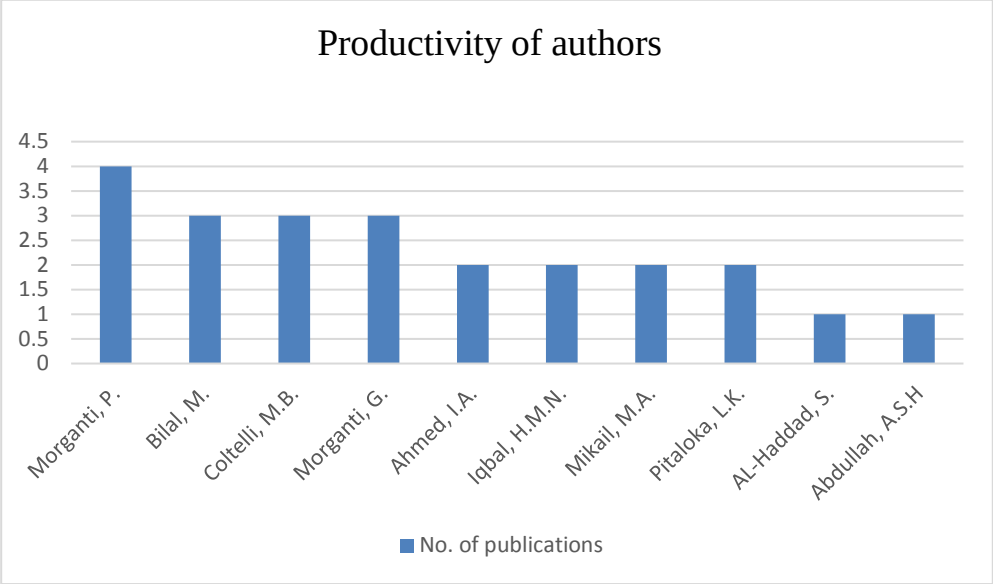

Figure 4. Most productive authors

Source: Authors' own research.

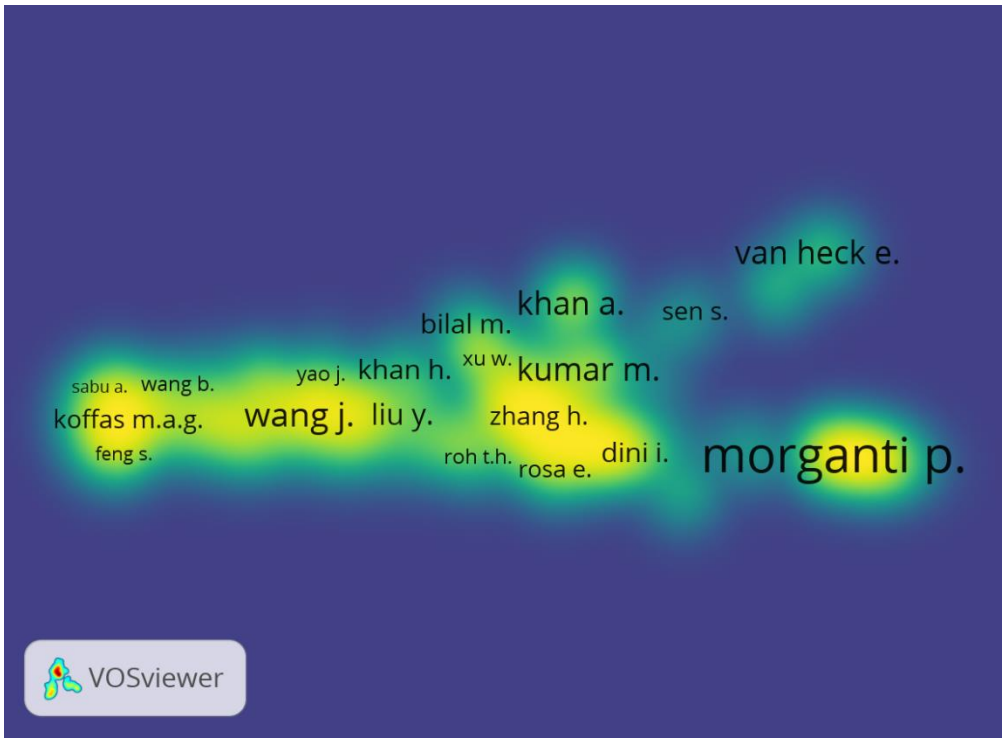

Figure 5. Most cited authors in density visualization

Source: Authors' own research.

The most productive organizations (Figure 6), with the average publication year being 2022, are: the Dermatological Department (China), the Research and Development Unit (Italy), the School of Pharmaceutical Sciences (India), the R&D Unit of the Academy of History of Healthcare Art (Rome, Italy), all of which have a relationship with the ISCD Nanoscience Center (Rome, Italy),

while the second cluster includes the Academy of History of Health Care Art (Italy), the Institute from the University of St. Petersburg (Russia), the Department of Dermatology (China Medical University) and the Department of Civil and Industrial Engineering (University of Pisa, Italy).

Figure 6. Most productive organizations networks in overlay visualization

Source: Authors' own research.

The collaborative relationship among organizations and institutions (Figure 7) can be noticed in the citation organization network analysis. The smaller the distance between the circles in the overlay display of the network, the higher the co-citations, which means that there is a higher number of publications between those organizations involved. It is noticeable that universities did not contribute as much as it would have been needed to this field of research, so this is a potential future opportunity for academics to step in and offer valuable insights from their expertise and they could also collaborate with institutes and beauty companies. China Medical University Shenyang contributed with 4 articles, University of Pisa with 4 as well, the ISCD Nanoscience Center with 3 articles, while the Academy of History of Healthcare Art, Tecnologico de Monterrey, Universiti Malaya and Huaiyin Institute of Technology published a number of only 3 articles. There are many stakeholders that could influence the integration of circular economy in the development, production, distribution and consumption of beauty products, and this is why research networks are vital.

Figure 7. Citation organization networks analysis in overlay visualization

Source: Authors' own research.

Among the most prolific countries in Figure 8, India (16 papers), China (14 papers), Indonesia (12 papers), Italy (12), and the United States (10 papers) are known to have provided articles and it is no wonder why Asian countries are at the top given the fact that most organic products are produced there as there is an important value placed on natural ingredients such as the green tea and other benefic plants. European countries would have been expected to have contributed to the literature because there are so many cosmetic and dermato-cosmetic brands launched in France or Spain, for example, and even researchers from South Korea could choose this topic due to the popularity of the Korean skin care products in the beauty market. The density citation country network analysis in Figure 9 was chosen to clarify from which countries the most cited articles are and it shows how many citations the countries have as follows: Italy (234), India (361), Indonesia (62), United States (116), China (194), France (109), Brazil (37), Germany (22) and Portugal (186).

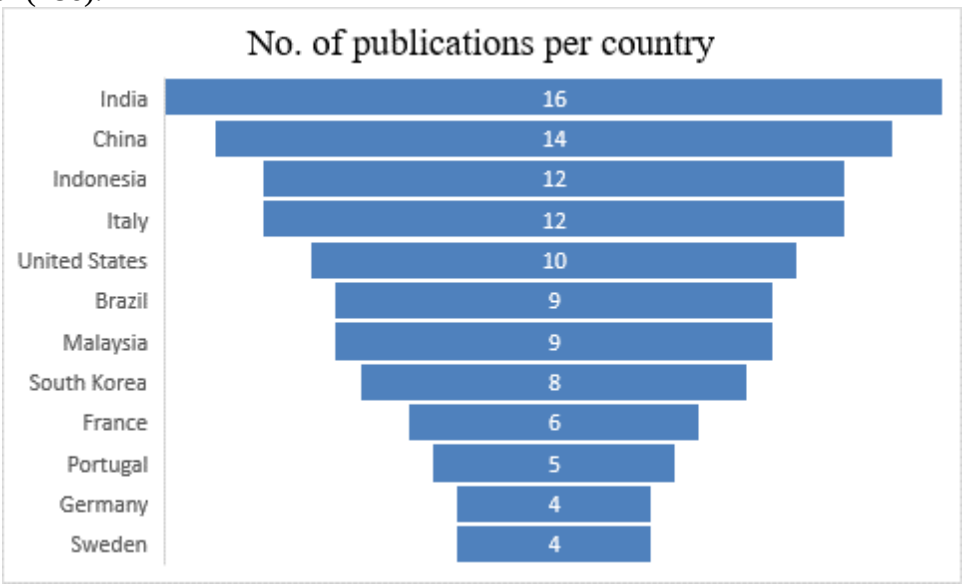

Figure 8. No. of publications per country

Source: Authors' own research.

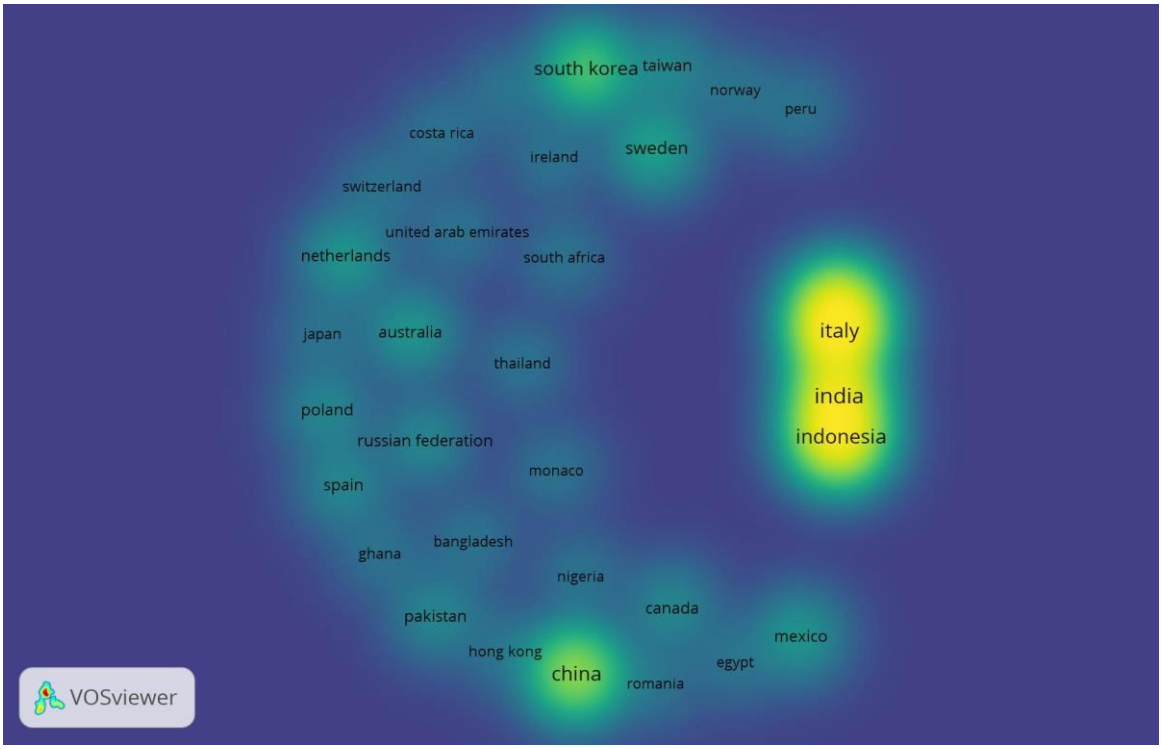

Figure 9. Citation country network analysis in density visualization

Source: Authors' own research.

Conclusions

This bibliometric analysis briefly demonstrates that sustainability in the beauty sector is a young topic which has just started to evolve in the last four years and will continue to evolve in the years to come. Even though India, China, Indonesia and Italy are the most prolific countries in the green beauty research, it is extremely important that other countries where the most well-known cosmetics, dermato-cosmetics and personal care products are created, like France for instance, start to encourage researchers to contribute to the literature with the purpose of promoting healthy products in relation to the users' health and the sustainable development goals that aim to protect the environment. The identified keywords and terms may shape potential future topics in the beauty industry in relation with the application of circular economy. The most productive and cited authors can influence future networks in the research field with the help of organizations, universities and companies. This paper's limitation lies in the usage of only one database (Scopus) and in the low number of existing articles published on the topic. Taking into consideration that no other bibliometric analysis research has been noticed on the issue of integrating circular economy in the beauty industry, future research could also include such analysis, besides the systematic literature review that could go deeper into the challenges and opportunities for transforming the beauty sector into a green and sustainable one.

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