

BIBLIOMETRIC ANALYSIS OF PUBLISHED PAPERS IN THE FIELD OF RASPBERRY CULTIVATION, TRENDS AND CHALLENGES IN SERBIA FOR THE PERIOD FROM 2019 TO 2024

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Abstract: This paper provides a detailed review of scientific publications on raspberry cultivation in Serbia, published over a five-year period from 2019 to 2024. Serbia, with its long tradition in raspberry production, is one of the leading exporters of this fruit, which is one of the most important components of the country's fruit production. The presented overview of the current state of raspberry production in Serbia, with a focus on economics and market dynamics, highlights the main factors that determine the setting of export prices, Serbia's competitive position in foreign markets, and the economic aspects related to raspberry production. Most research publications are conducted by Serbian institutions and researchers, which enhances the understanding of the importance of this topic and could generate greater interest from the scientific and professional community.

Key words: raspberry, sustainability, branding, marketing opportunities, economic analysis

1. INTRODUCTION

Raspberries are considered one of the most valuable fruit species in the world, gaining increasing significance in agriculture, trade, and various industries. While raspberry cultivation is becoming more widespread globally, it remains one of the least produced fruits in terms of quantity [2]. In the context of global raspberry production, Serbia holds a key position as one of the leading exporters. Raspberries have a long tradition of cultivation in Serbia and have become one of the most important components of the country's fruit production in recent decades [6]. According to 2022 data, Serbia is the third-largest producer of raspberries in the world, following the Russian Federation and Mexico, and ahead of Poland and the United States, which rank fourth and fifth, respectively. In 2022, raspberry production in Serbia amounted to 116,093 tons.

Domestic consumption of raspberries is lower than production levels, and a large quantity of raspberries is exported each year. As a result, raspberries play a significant economic role and are essential for the country's economic development [11]. In 2021, Serbia exported fruits worth over 824 million euros, of which 361 million euros came from frozen raspberries alone [2]. Fresh and frozen raspberry varieties from Serbia are of high quality and in great demand on global markets. In addition to exporting fresh and frozen raspberries, Serbia is also active in the global market for raspberry-based products, such as candied, freeze-dried, and other types of dried products. There is also a growing demand for raspberry wine, vinegars, creams, and jams [6].

An analysis of demand trends and export strategies should be conducted due to the significance of the raspberry brand for Serbia [3]. This paper reviews recent scientific literature on raspberry cultivation in Serbia, including export-import analysis and demand. Based on the critical findings of relevant studies, it assesses the main factors that determine the setting of export prices, Serbia's competitive position in foreign markets, and the economic aspects related to raspberry production. This paper provides a more comprehensive overview of the current state of raspberry production in Serbia, focusing on economics and market dynamics, as well as identifying the major issues and opportunities within both local and international markets.

2. PUBLICATION STATISTICS

The next section presents a series of selected statistics related to scientific publications on raspberry cultivation, market behavior, economic assessments, and competitive production in Serbia.

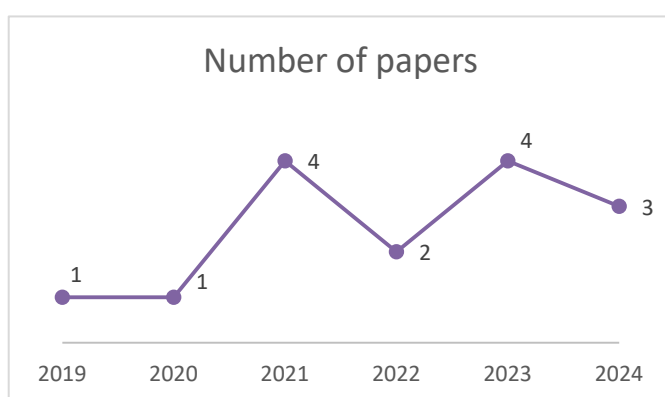
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The review covers publications released over a five-year period, from 2019 to 2024. This time frame was chosen because it reflects important global trends and challenges, such as market instability, technological advances, the impact of the COVID-19 pandemic, climate change, and changes in international trade policies. A total of 15 papers, sourced from Google Scholar through keyword search, address various aspects of raspberry production, including supply and demand, international exports, production costs, and market competitiveness. Additionally, some papers examine marketing and branding issues, as well as the impact of social media presence. Given the specific focus of the topic, it is not surprising that much of the research is conducted by Serbian institutions and researchers, which enhances the understanding of local production dynamics, economic characteristics, and the challenges faced by the raspberry sector.

Statistics regarding the number of scientific publications in the area considered are presented in Figure 1. Given the importance of this topic, one would expect a greater number of published works and a higher level of interest from the scientific and professional community, but only 15 papers are published in the chosen period.



An analysis of the keywords used in scientific publications within specific areas of interest can provide guidelines for further research in the field. A total of 56 different keywords were identified across the 15 scientific publications. As expected, the most frequent keywords include "raspberry" and "Serbia." Based on these keywords, we identified four key topics addressed by the papers and decided to conduct further research on these topics (Table 1).

Table 1 – Frequent keywords and defined topics

Key words	Topics
organic agriculture, organic farming, soil type/analysis	Sustainability and organic agriculture
economic analysis, costs, gross margin	Economic analysis
export, price, competitiveness, market, demand, supply, sales	Demand for raspberries, export and competitiveness
branding, geographical indication, tourism, regional recognition	Branding and market opportunities of Serbian raspberries

1.1. Sustainability and organic agriculture

Sustainability is a modern concept that deals with meeting current needs without compromising future well-being. Although sustainability is currently attached to a wide range of fields, its most common research and application are in the production of products, for example, in organic agriculture [16]. In the research studies analyzed in this paper, a significant number focuses on the sustainability practices in raspberry production.

In an exploratory study, Stojanović et al. [5] investigate the sustainability practices adopted by agricultural producers in western Serbia, with a particular focus on Arilje, a region known for its significant raspberry production. The results show that the sustainability actions taken by farmers are influenced by the type of agreements they enter - formal or informal. Farmers engaged in formal contracts, including established networks and legally binding agreements with both buyers and suppliers, demonstrate a higher level of sustainability awareness. As a result, they are more likely to align their production and marketing efforts with the principles of sustainable development. In contrast, farmers operating under informal agreements tend to prioritize innovations, such as the creation of new sales channels, the establishment of business partnerships, and the enhancement of product value; however, they do not show the same inclination to adopt sustainability practices. These agricultural producers are often referred to as "entrepreneurial farmers." The authors emphasize the importance of tailored agricultural policies for both types of farmers, which would encourage the adoption of sustainability practices alongside innovations, supported by improved institutional networks and increased institutional support.

Investigations into organic raspberry cultivation in Serbia have identified numerous challenges as well as potential avenues for future advancement. Stojkov Pavlović et al. [1] present compelling evidence indicating that soil quality plays a crucial role in determining both the yield and the overall quality of raspberries. Their research highlights the importance of evaluating the qualitative attributes of various soil types and enhancing soil vitality using organic fertilizers. The results show that a significant number of Serbian producers are involved in fruit production, with raspberries being the primary crop, often processed into products such as frozen, dried, and freeze-dried raspberries. However, soil pollution severely degrades soil quality, making large areas of land unsuitable for agricultural production. This poses a significant challenge to organic farming practices, especially in raspberry cultivation.

In contrast, Golijan et al. [4] argue that soil pollution is not the primary barrier to introducing organic farming practices in Serbia. These authors conclude that the soils in Serbia have relatively high potential and capacity for organic agricultural purposes, especially in the western part of the country, specifically the region where Arilje is located, which contributes around 30% of the world's raspberry harvest. Although there is a positive trend in the increase of land allocated to organic agriculture, Golijan et al. emphasize that the limited ability to adopt complex agricultural technologies, along with land fragmentation, are the main factors hindering the integration of modern agricultural practices.

Both studies emphasize the need for a dual approach to promote organic agriculture in Serbia. This approach should focus on improving soil quality and pollution control, while simultaneously stimulating innovation and sustainability. Moreover, education and knowledge-building in these areas are crucial, as is the strengthening of institutional networks to support the growth of organic raspberry production.

1.2. Economic analysis

The significance of raspberry production for Serbia's economy is frequently discussed, and as a result, it was somewhat expected that a portion of the analyzed papers would focus on the economic analysis and benefits of raspberry cultivation for the country's economy. In the presented study, Pantić and coauthors [6] highlight that although Serbia has significant comparative advantages in raspberry production, which are not fully recognized, the key to leveraging these advantages lies in improving the relationship between the country administration and legislation and the producers. They suggest motivating farmers not only to cultivate existing plantations but also to expand them. In addition to increasing the land area under raspberries, they recommend investing in better infrastructure, especially in rural areas, to encourage large-scale production. Along with the points raised by Pantić et al., the authors of the other two studies [7], [12] analyzed the cost structure (summarized in Figure 2) related to raspberry harvesting on family farms in Western Serbia, as these are key factors in raspberry production in the country.

Figure 2 – Cost structure in raspberry production [7], [12]

Both studies indicate that labor costs constitute the largest portion of all expenses. According to Veljković et al., labor costs account for around 45% of the total costs, while for Kljajić, they amount to a staggering 59.67%. Additionally, the authors emphasize that sales volume is dependent on the purchase price. Therefore, it is crucial to maintain a controlled gap between purchase and export prices, as the gross margin is highly sensitive to changes in the purchase price.

1.3. Demand for raspberries, export and competitiveness

All five articles point to Serbia as one of the largest global exporters of frozen raspberries. They show that the European Union, particularly Germany, France, and Italy, is the main market for Serbia due to a raspberry shortage in the EU. These publications identify important issues and recommend solutions for the export market position of Serbia (Table 2).

Table 2 – Identified problems and proposed solutions [2], [8], [9], [10], [11]

Identified problem	Description of the problem	Proposed solution	Description of the solution
Unstable purchase price	The price of raspberries fluctuates due to global market trends which result in instability among producers and makes planning more difficult.	Long-term contracts	Establishing long-term contracts with buyers which would ensure a stable income for producers and reduce fluctuations in the purchase price.
Variations in products quantity	Supply inconsistencies resulted from fragmented production and the inability of small producers to fulfil larger orders.	Establishing cooperative groups	Connecting smaller producers into cooperative groups could lead toward better organization and larger production capacities.
Shifts in produce quality	Distinctions in harvesting and production practices, as well as in product standards, lead to variations in achieved quality.	Standardization of quality	Implementing uniform quality standards across the industry would improve consistency in the high quality of products and ensure competitiveness in the global market.
Global competitors	Serbia's global market share is increasingly compromised by new producers with the same target markets, such as Poland and Bulgaria.	Embracing and implementing innovations	Investing in new technology in production would likely result in added value to products and higher profits.
Dropping demand on key markets	The biggest buyers of Serbian raspberries, the first being Germany, France, and other EU countries, have recorded decreased demand in the last few years.	Market diversification	Expanding Serbia's export markets beyond the already saturated ones would contribute to the country's export independence and greater growth opportunities.
Standardized product offering	Serbia mostly exports frozen, fresh and dried raspberries, while disregarding the growing trend for raspberry-based products such as jams, juices, wines, vinegars, etc.	Targeted product investment	Investing in modern processing facilities to export high-demand raspberry products would improve market position and increase revenue per unit.

1.4. Branding and market opportunities and of Serbian raspberries

Regarding future market opportunities, the authors of the four considered papers emphasize the potential for establishing a commodity exchange for raspberries and the importance of building a brand for Serbian raspberries. In two separate studies, Stojković et al. [14] and Šapić et al. [15] examine whether the Serbian raspberry market would be a good fit for implementing a commodity exchange. Both studies conclude that a large portion of raspberry producers in Serbia are dissatisfied with the current pricing policies and the relationship between producers and cold storage facilities. They argue that fluctuations in purchase prices, along with poorly equipped cold storage facilities, lead to dissatisfaction and a loss of loyalty among producers.

Many producers are increasingly interested in commodity exchange due to poor customer service from cold storage facilities and the dependency of raspberry purchases on buyer agreements. While many producers are interested in improving the quality of their products, the authors underline that developing a successful commodity exchange in the raspberry sector of Serbia requires first building up authorized warehouse networks to standardize quality and quantity. They also point out that cooperative producer groups are necessary to ensure sufficient supply to the exchange. Both studies point out the potential of the Serbian raspberry market and the need for a commodity exchange that would provide more transparency in purchasing, based on better organization of producers and standardized production.

In addition to potential market changes, other authors highlight the significance of building the so-called Serbian raspberry brand. Given that raspberry exports reached a remarkable 230 million euros in 2022 [17] and the global recognition it has gained, authors from two of the analyzed studies argue that developing the Serbian raspberry brand would foster stronger positive associations and greater interest in both Serbia and its products. They identify key elements related to the branding process of Serbian raspberries and suggest strategies for these elements (Table 3).

Table 3 – Key elements of building a brand of Serbian raspberry [3], [13]

Key element	Strategy
Recognition of Serbian raspberry	Widening the circle of recognition for Serbian raspberries through digital marketing activities – active presence on social media and other online platforms, as well as collaborations with influencers.
Branding through creative tourism	Preserving the autochthonous way of life, implementing various creative workshops, and creating unique experiences to contribute to the development of rural tourism in Serbia.
Geographical origin label	Maintaining the recognition of raspberries harvested on Serbian land by registering a label that would tie the raspberry not only to Serbia but also to the specific climate and soil conditions within the country's borders, as well as the perceived level of quality.
Economic development	Investing in exporting greater amounts of raspberries under the “Made in Serbia” label to strengthen the market position and visibility of Serbian products.
Sustainable development	Promoting local brands and emphasizing sustainable practices in production and marketing.

2. CONCLUSION

The Serbian raspberry market has great potential to become the leading fruit sector in agriculture and the national economy. Its tradition in raspberry cultivation, favorable conditions, and strong export market give it a huge potential for development. The publications analyzed offer many good opportunities, which underline the fact that raspberries play an important role not only in the agricultural sector of Serbia but also in the international marketplace. The next critical step for Serbia is to exploit these opportunities by converting them into real strengths that will drive economic growth, rural development, and global competitiveness. This study points out challenges that may impede the progress of the sector, such as infrastructure problems, insufficient support to innovation, and a disintegrated raspberry production system. However, the paper recognizes that these challenges are also opportunities to be exploited for the benefit of the Serbian economy. Serbia can further elevate its position in the global marketplace with better quality and sustainability of raspberry production, together with increasing exports of both raw and processed products.

The purpose of this paper is to review the impact of scientific research on the raspberry sector with emphasis on applying academic findings for the betterment of the industry. It also identifies the need for cooperation, with researchers bridging the gap between government legislation and raspberry producers. It can be ensured that scientific findings translate into policies for the benefit of the sector. Collaboration is very important in addressing challenges in the industry and leveraging the advantages Serbia has. With these strategies, Serbia could address its weaknesses and become a world leader in raspberry production and export.

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