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# CONVENTIONAL AND ORGANIC HONEY PRODUCTION AND QUALITY: A WORLDWIDE PERSPECTIVE

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## ABSTRACT

**Theoretical Framework:** Honey production in the country is mainly carried out by family farmers, contributing to sustainable development and biodiversity. Organic honey production is a relevant topic, driven by the movement towards healthy foods. Brazil leads global organic honey production, standing out for being produced in native forest areas without the use of pesticides. Organic certification plays a crucial role, ensuring product quality, free from chemical contaminants, and promoting sustainable practices.

**Objective:** To deepen the understanding of honey production and quality, focusing on the characteristics of traditional and organic honey, production at both global and Brazilian levels, beekeeping practices, family farming, and the production and certification of organic honey.

**Methodology:** The Methodi Ordinatio protocol was used, a theoretical approach methodology based on literature review from platforms such as CAPES, WebSciense, Google Scholar, and PubMed, for the selection of scientific articles.

**Results and Discussion:** The analysis highlighted the economic importance of honey and the challenges in organic production, such as the need for technical assistance and access to technologies. In summary, the article provides a comprehensive view of honey production and quality, emphasizing the relevance of organic production and certification as essential factors for sustainable practices.

**Keywords:** Beekeeping, Family Farming, Organic Certification.

## CONVENTIONAL AND ORGANIC HONEY PRODUCTION AND QUALITY: A WORLDWIDE PERSPECTIVE

## RESUMO

**Referencial Teórico:** A produção de mel no país é realizada principalmente por agricultores familiares, contribuindo para o desenvolvimento sustentável e a biodiversidade. A produção orgânica de mel é tema relevante, impulsionado pelo movimento em direção a alimentos saudáveis. O Brasil lidera a produção global de mel orgânico, destacando-se por ser produzido em locais de mata nativa e sem o uso de agrotóxicos. A certificação orgânica desempenha papel crucial, garantindo a qualidade do produto, livre de contaminantes químicos e promovendo práticas sustentáveis.

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**Objetivo:** Aprofundar o entendimento sobre a produção e qualidade do mel, com foco nas características do mel tradicional e orgânico, na produção tanto a nível mundial quanto brasileira, na prática da apicultura, na agricultura familiar, na produção e certificação do mel orgânico.

**Metodologia:** Foi utilizado o protocolo Methodi Ordinatio, uma metodologia de abordagem teórica baseada em revisão de literatura de plataformas como CAPES, WebSciense, Google Scholar e PubMed, para a seleção de artigos científicos.

**Resultados e discussão:** A análise ressaltou a importância econômica do mel e os desafios na produção orgânica, como a necessidade de assistência técnica e o acesso a tecnologias. Em suma, o artigo oferece uma visão abrangente sobre a produção e a qualidade do mel, enfatizando a relevância da produção orgânica e a certificação como fatores essenciais para práticas sustentáveis.

**Palavras-chave:** Apicultura, Agricultura Familiar, Certificação Orgânica.

**PRODUCCIÓN Y CALIDAD DE LA MIEL CONVENCIONAL Y ORGÁNICA: UNA PERSPECTIVA MUNDIAL**

**RESUMEN**

**Marco Teórico:** La producción de miel en el país es realizada principalmente por agricultores familiares, contribuyendo al desarrollo sostenible y la biodiversidad. La producción orgánica de miel es un tema relevante, impulsado por el movimiento hacia alimentos saludables. Brasil lidera la producción global de miel orgánica, destacándose por ser producido en áreas de selva nativa y sin el uso de agrotóxicos. La certificación orgánica juega un papel crucial, garantizando la calidad del producto, libre de contaminantes químicos, y promoviendo prácticas sostenibles.

**Objetivo:** Profundizar en la comprensión de la producción y calidad de la miel, con énfasis en las características de la miel tradicional y orgánica, la producción a nivel mundial y brasileña, la práctica de la apicultura, la agricultura familiar y la producción y certificación de la miel orgánica.

**Metodología:** Se utilizó el protocolo Methodi Ordinatio, una metodología de enfoque teórico basada en la revisión de literatura de plataformas como CAPES, WebSciense, Google Scholar y PubMed, para la selección de artículos científicos.

**Resultados y Discusión:** El análisis resaltó la importancia económica de la miel y los desafíos en la producción orgánica, como la necesidad de asistencia técnica y el acceso a tecnologías. En resumen, el artículo ofrece una visión integral de la producción y calidad de la miel, enfatizando la relevancia de la producción orgánica y la certificación como factores esenciales para prácticas sostenibles.

**Palabras clave:** Apicultura, Agricultura Familiar, Certificación Orgánica.



## 1 INTRODUCTION

Honey is an apiculture product produced by Apis melífera bees from the nectar of flowers, secretions of other vegetations, as well as excretions of plant-sucking insects (ALVAREZ-SUAREZ et al., 2014), being processed under the action of enzymes produced by the hypopharyngeal glands of bees, converting sucrose from nectar into glucose and fructose (RICHTER et al., 2011).

Honey possesses many of the medicinal properties of plants transmitted indirectly through honey and other apiculture products (ALVAREZ-SUAREZ et al., 2014), which give honey antimicrobial properties, due to the low concentration of water, which inhibits the growth of microorganisms (GUZIY et al., 2017), in addition to antioxidant properties, acting on the degradation of free radicals, as described by Alzahrani et al. (2012), scarring, strengthening of the immune system, benefits in ocular, neurological and fertility disorders (RAO et al., 2016) and, according to Swellam et al. (2003) Fukuda et al. (2011) Ghashm et al. (2010), also have anti-cancer properties, through the inhibition of proliferative processes of cancer cells, among other medicinal and therapeutic properties (ŠEDIK et al., 2019). And because of this, several studies have shown that consumers show a growing interest in healthy food products that can help maintain or improve human health (TESTA et al., 2019).

This article offers a comprehensive overview of the topics discussed in the study, addressing several concepts related to honey, both in its traditional and organic form. The distinct characteristics of these varieties of honey are highlighted, exploring their floral origin, seasonality and handling practices that influence their chemical properties. In addition, the chapter explores honey production on a global scale, with a specific focus on the realities of Brazil, where beekeeping and family farming play crucial roles. Organic honey production is also discussed, considering the move toward healthier and more sustainable foods. In addressing these topics, the chapter provides a broad overview that serves as a basis for understanding the economic importance of honey, the challenges faced in production, especially in the organic sphere, and the need for sustainable practices, including certification to ensure product quality.

## 2 LITERATURE REVIEW

According to the Food and Agriculture Organization of the United Nations (FAO, 2021), China is the largest producer and exporter of honey and Brazil, in turn, ranked 11th in global honey production in 2020 (VIDAL, 2021). The great expansion in honey production and supply in the domestic market, has gained much strength in relation to the expansion of apiculture in Brazil, making it a major producer of both honey and its apiculture products, due to the international interest vis-à-vis domestic products (GOIS et al., 2013) and, for there to be a greater recognition and preference for the national product in relation to both domestic and

international consumer markets, there is the constant need for the quality control of the product in the face of fraud committed by producers, with motivation, mainly, financial.

According to data from Brazil Lets Bee (2023), the South and Northeast regions are the leaders in the production of Brazilian honey, with production in tons almost equal in 2020. The difference between these regions can be seen by the difference in growth over the years, with the Southern region already producing a high quantity in 2016 (17,147 tons) and increased to 19,617 tons in 2020; while the Northeast region increased its production considerably, from 10,458 tons (2016) to 19,329 tons (2020). It was possible to observe, the rapid growth of the Northeast region, reaching that of the South region in 2020. The other regions, on the other hand, kept their production stagnant, without any significant change as time went by.

The United States is the main importer of Brazilian honey, with quantities varying over the years, but the total percentage has decreased from 82% to 70%. In addition, countries such as Germany have increased imports considerably. Quantities may have varied by several factors, such as increased presence of competition.

Another factor of relevance observed was in relation to price, which followed the trends of exported quantity, which can be explained by the increase of production in the northeast region and higher demand during the COVID-19 pandemic due to its image of healthy product and food safety (VIDAL, 2021). It is worth remembering that there is a difference in the market for honey produced in Brazil, with a considerable decrease in domestic consumption concomitant with an increase in exports.

## 2.1 BEEKEEPING AND FAMILY FARMING

Beekeeping in Brazil is carried out, in its vast majority, by family farmers because it is an alternative source of income of low initial cost and easy maintenance when compared to other farming activities (FREITAS et al., 2004), besides contributing to sustainable development, increase of local biodiversity (LOURENÇO; CABRAL, 2016) and promote the permanence of man in the rural environment.

According to Del Grossi (2019), the definition of family farming is currently established in Article 3 described in Law 11.326 (BRAZIL, 2006), which considers the family farmer and rural family entrepreneur, who practices activities in the rural environment, with predominance

of family work compared to paid work in the conduct of agricultural works and, in addition, who does not have a larger area of four rural modules.

According to Hoffmann (2014), the family farmer is responsible for less than 25% of the basic food produced, contrary to the disclosure made by official bodies that consider 70% the percentage of total food produced by family farmers. Data presented by the Brazilian Agricultural Census in 2017 (AGROPECUÁRIO, 2017), according to Del Grossi et al. (2020), show that in the period 2006 to 2017, there was a significant decline in production from family farming, from 35% in 2006 to 23% in 2017. However, there was a growth in the production of those considered to be unfamiliar (from 65% to 77%). The Food and Agriculture Organization of the United Nations (FAO, 2021) has reported that they account for less than 10% of the total food produced by this system.

In this context, it is worth noting that the Beekeeping Agribusiness in Brazil has been outstanding since the eighties. According to Balbino et al. (2015), beekeeping has been growing with the naturalist movement that advocates the consumption of healthier foods in order to promote food security and quality of life for consumers. Consequently, it has enabled family farmers (beekeepers) to increase their demand for apiculture products, increase the value of their products and, as a result, improve their remuneration (DE OLIVEIRA et al., 2010). However, family beekeeping faces several obstacles such as the high values of the instruments used, the large bureaucracy of the competent bodies, the deficiency in the production process due to qualified professionals in the area, deficiency in technical assistance, lack of vocational courses with family beekeepers, lack of credit channels by institutions, among others (POSTELARO et al., 2021).

In Brazil, beekeeping can be carried out in two ways: migratory (where beehives are transported to regions with a higher probability of production) and fixed (where there is no transplant of beehives), the latter being the predominant form among family beekeepers (BALBINO et al., 2015; REIS et al., 2011). In addition, there is the question of how beekeeping production takes place within the property. In the case of honey, the forms of the apiculture chains can be organic, agroecological, besides the production carried out through extractivism.

## 2.2 ORGANIC PRODUCTION OF HONEY

Organic food production was evidenced in the late 19th century, from social movements that were contrary to the traditional food production system, which subdivided the production system into conventional and alternative (subdivided into biodynamic, biological, natural and

organic agriculture) (DE MORAES et al., 2017). This movement began in the 1920s and 1930s, following studies carried out by the English researcher Sir Albert Howard in India, where he observed that the Hindu production systems, with the use only of inputs produced on the property itself and free of agrochemical products, were responsible for both high productivity and low incidence of diseases (EHLERS, 2009). And from these studies by Howard, we got the foundation that makes organic agriculture. ¬

Concern with food quality, health benefits, concern for animal welfare and the preservation of biodiversity (MICHELS et al., 2019), the world population started to seek food of animal and plant origin, produced in the organic system (SIQUEIRA et al., 2012), formed, in its great majority, by producers certified by entities accredited for the practice of family organic farming.

Therefore, the production of organic food presents great potential for economic growth due to the growing demand in the domestic and foreign markets, besides the credibility conferred in the certification process of these products, which has an important role in the productive chain, because the consumer feels safe in relation to the food consumed (SOARES et al., 2021).

In order to be considered organic, the honey must be free of any chemical contamination, including that associated with the migration process of bees in search of good blossoms, which are not directly controlled by beekeepers and may be contaminated with chemical products until the final packaging process, and the basic requirement is the possibility of controlling the origin of the product and the production process (BUAININ et al., 2007).

This growing increase in demand for organic products has attracted increasing attention, especially from small family farmers, linked to associations, cooperatives and movement groups, which aim at a better source of income and consequently improvement in the quality of life of their family members (MICHELS et al., 2019). Castro (2005) concluded in a study carried out on family-run organic farms in the Federal District and the Surrounding Region, that this activity is not only an excellent option for family farmers in terms of quality of life, but also provides food quality, environmental conservation and a great increase in income and job creation. In addition, Neto et al. (2010) added that "in the current context, small landowners see in organic agriculture a diversified production activity and a strategy to promote their economic and social development, adding value to their products" (DE MORAES et al., 2017).

However, several obstacles that slow down or prevent organic production by family farming are observed: lack or deficiency in technical assistance, differentiated credit with the financing agencies, difficulty or lack of knowledge in relation to the certification process;

difficulty in access to new production technologies; deficiency in the infrastructure of the properties, besides a logistics suitable for each production unit related to the organic market (DE MORAES et al., 2017).

In spite of all the obstacles presented by these authors, the organic honey market is one of the most promising businesses in farming. Proof of this is that Brazilian honey leads the ranking of organic producers in the world and that, unfortunately, there are not enough producers in Brazil to meet the international demand for the product. During the pandemic period, organic honey was valued at 70% (in 2020, 1 kg of honey was worth USD 1.97 cents; in 2021, the same amount of honey was worth USD 3.33 cents). In addition, the differential and predilection of Brazilian organic honey over other countries is that it is produced in native forest locations and without the use of agrochemicals (TREVISOL et al., 2022).

It is important to point out that the increase in honey exports, mainly to the United States, is due to the fact that Brazilians consume little honey when compared to other countries. Studies have shown that Brazilians consume on average 140 grams a year, while in the United States this consumption reaches 900 grams and in Germany 3 kg (TREVISOL et al., 2022).

There is growing concern with maintaining the quality of honey produced in Brazil, as well as the knowledge of the variation in the characteristics used as indicators of quality. Therefore, it is important to study and quantify the behavior of quality indicator parameters at all stages of the production process, generating information that can minimize deterioration and consequently extend the shelf life of the honeys (MEDEIROS et al., 2016).

There is recognition both from the scientific and technical community and from public bodies of the need for greater attention to be paid to the quality of products originating from organic units or ecologically based production processes, with regard to hygiene processes during production, the use of pesticides and pesticides in the region where the hives are located and the indiscriminate use of veterinary products in beekeeping units.

It is against this background that the certification systems were created. These are normative instruments that guide farmers throughout their production chain. It is these instruments that enable such producers (beekeepers) to be recognized as practicing organic farmers.

## 2.3 CERTIFICATION

Certification is a guarantee that the consumer has in purchasing quality products at a fair price, healthy from the point of view of food safety, free from biological hazards, chemical

hazards and which are produced with the least use of artificial inputs. In addition, today, there is also concern about the preservation of the environment and biodiversity as a source of generation of rural jobs and reduction of rural exodus (SOARES, 2006)

In addition, for the product to be considered as organic, the property must have specific certification, and the production must comply with stages of the organic production chain, according to Law 10.831/2003 and Ordinance 52/2021 (BRAZIL, 2021). According to Art. 1 (BRAZIL, 2003), an organic system of production is considered any system in which techniques are adopted, by optimizing the use of the natural and socioeconomic resources available and respecting the cultural integrity of rural communities. This certification must be carried out by accredited certifier or by accredited participatory body (SOARES et al., 2021).

Certification for the marketing of organic products aims to ensure high quality products for consumers by regulating the processes that make up the production chain of these products (the way in which they are produced, stored, processed and marketed). And so that there are no failures in the production stages, monitoring by an independent third sector is necessary (FIGUEIREDO et al., 2012). To acquire the certification of honey as organic, it is necessary that a certifying agency, duly accredited by the Ministry of Agriculture, Livestock and Supply (MAPA) and accredited by the National Institute of Metrology, Standardization and Industrial Quality (Inmetro), ensures that the product is able to receive a seal fixed on the product label (BRASIL, 2016). It is a decisive tool for gaining greater credibility from consumers, as well as giving greater transparency to practices and principles used in organic production (NASCIMENTO et al., 2012). The control mechanism of the organic certification is the guarantee of the origin and the organic quality of the product, which consequently will be more valued.

The central problem of the study is the analysis of organic-based production in the context of family farming and its relationship with the instruments of organic legislation. The implementation of this research leads us to the analysis of the productive strategies of the local farmers and their relationship with organic productive practice.

For this to happen, it is necessary, through scientific works, the dissemination of the results of the researches carried out, in order to add technologies to the productive chains and to diminish the prejudice related to organic production, which will bring about the advance of knowledge and a greater supply in the national and international markets, having a productive vision of organic systems based on the environment.

## 3 METHODOLOGY

A literature review was conducted, using databases such as CAPES, WebScience, Google Scholar and PubMed to select relevant articles. In addition, the Methodi Ordinatio (M.O.) protocol was used, which is a multi-criteria method for selecting scientific articles based on three main factors: number of citations, impact factor of the journal and year of publication. A survey of organic honey producers in Brazil was also carried out, where data from CNPO (BRAZIL, 2021) and associations and cooperatives of organic producers in the Federal District were consulted. It is worth pointing out that the articles were selected and analyzed according to their relevance to the theme of this research.

## 4 RESULTS AND DISCUSSIONS

The articles chosen, with their title, Impact Factor (F.I.), number of citations (C.I.) and the final note In Ordinatio, are presented in Table 1.

**Table 1**

*Articles selected by Methodi Ordinatio with their classification in In Ordinatio (Number), Article Name, Authors, Magazine, Impact Factors (FI), number of citations (CI), year of publication and final note Ordinatio*

| 1 | Number | 2. Article Name | 2 Authors | 3 | FI | 4 | CI | 5 | Ordinatio |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 1 | 7 Attitudes towards honey among Italian consumers: a choice experiment approach | 8 Cosmina, M., Gallenti, G., Marangon, F., & Troiano, S. (2016) 9 *Acta Agronómica* | 10 | 4,58 | 11 | 90 | 12 | 134,58 |
| 13 | 2 | 14 The Current Situation on the International Honey Market | 15 García, N. L. (2018) 16 *Bee World* | 17 | 1,5 | 18 | 66 | 19 | 127,5 |
| 20 | 3 | 21 The impact of packaging design on the perceived quality of honey by brazilian consumers | 22 Nascimento, A. G., Toledo, B. S., Guimarães, J. T., Ramos, G. L., da Cunha, D. T., Pimentel, T. C., ... & Márs ico, E. T. (2022) 23 *Food Research International* | 24 | 6,48 | 25 | 1 | 26 | 107,47 |
| 27 | 4 | 28 Analysis of Consumers' Willingness to Pay for Organic and Local Honey in Serbia | 29 Vapa-Tankosić, J., Ignjatijević, S., Kiurski, J., Milenković, J., & Milojević, I. (2020) | 31 | 3,25 | 32 | 21 | 33 | 104,251 |

| 1 | Number | 2. | Article Name | 2 | Authors | 3 | FI | 4 | CI | 5 | Ordinatio |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 30 | *Sustainability* | | | | | | |
| 34 | 5 | 35 | Consumers' attitude towards honey consumption for its health benefits: first insights from an econometric approach | 36 | Zanchini, R., Blanc, S., Pippinato, L., Di Vita, G., & Brun, F. (2022) | 38 | 2,52 | 39 | 1 | 40 | 103,518 |
| | | | | 37 | *British Food Journal* | | | | | | |
| 41 | 6 | 42 | Physicochemical properties, mineral content, antioxidant activities, and microbiological quality of Bupleurum spinosum Gouan honey from the middle atlas in Morocco | 43 | Laaroussi, H., Bouddine, T., Bakour, M., Ousaaid, D., & Lyoussi, B. (2020) | 45 | 2,45 | 46 | 20 | 47 | 102,45 |
| | | | | 44 | *Journal of Food Quality* | | | | | | |
| 48 | 7 | 49 | Honey Consumption of Individuals and Reasons for Preference Zara Honey That a Local Product (Sivas Provincial Center District) | 50 | İlkay, G. Ö. K.; Tezçi, S. (2022) | 52 | 0,46 | 53 | 0 | 54 | 100,46 |
| | | | | 51 | *Food Health and Technology Innovations* | | | | | | |
| 55 | 8 | 56 | Perception regarding honey consumption in the state of Roraima | 57 | Ferreira, M., Siqueira, H., Cipriano, L. C., Messias, C. T., & Siqueira, A. (2022). | 59 | 0 | 60 | 0 | 61 | 100 |
| | | | | 58 | *Ars Veterinaria* | | | | | | |
| 62 | 9 | 63 | Total brood removal and other biotechniques for the sustainable control of Varroa mites in honey bee colonies: economic impact in beekeeping farm case studies in northwestern Italy | 64 | Mancuso, T., Croce, L., & Vercelli, M. (2020). | 66 | 3,25 | 67 | 15 | 68 | 98,25 |
| | | | | 65 | *Sustainability* | | | | | | |
| 69 | 10 | 70 | Food packaging design and consumer perception of the product quality, safety, healthiness and preference | 71 | Bou-Mitri, C., Abdessater, M., Zgheib, H., & Akiki, Z. (2021). | 73 | 1,37 | 74 | 15 | 75 | 96,37 |
| | | | | 72 | *Nutrition & Food Science* | | | | | | |
| 76 | 11 | 77 | Perfil dos consumidores de mel em feiras livres de Porto Seguro, Bahia, Brasil | 78 | de Novais, J. S., Marques, G. V., de Oliveira, R. J. B., & da Silva Balio, A. R. (2021) | 80 | 2,29 | 81 | 2 | 82 | 94,29 |
| | | | | 79 | *International Journal of Business Marketing* | | | | | | |
| 83 | 12 | 84 | Perfis dos produtores, comerciantes e consumidores de mel da cidade de Barreiras – Bahia | 85 | Alves, L. R. P., de Souza, C. F., Mamede, A. M. G. N., de Oliveira Lima, F. S., & Lima, Í. A. (2021) | 87 | 1,7 | 88 | 0 | 89 | 91,7 |
| | | | | 86 | *Research, Society and Development* | | | | | | |

| 1 | Number | 2. | Article Name | 2 | Authors | 3 | FI | 4 | CI | 5 | Ordinatio |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 13 | 91 | Consumer behaviour towards honey products in Western Australia | 92 | Batt, P. J., & Liu, A. (2012) 93 *British Food Journal* | 94 | 2,52 | 95 | 88 | 96 | 90,518 |
| 97 | 14 | 98 | Honey: food or medicine? A comparative study between Slovakia and Romania. | 99 | Šedík, P., Pocol, C. B., Horská, E., & Fiore, M. (2019) 100 *British Food Journal* | 101 | 2,52 | 102 | 15 | 103 | 87,518 |
| 104 | 15 | 105 | Quality Determinants and Effect of Therapeutic Properties in Honey Consumption. An Exploratory Study on Italian Consumers | 106 | Testa, R., Asciuto, A., Schifani, G., Schimmenti, E., & Migliore, G. (2019) 107 *Agriculture* | 108 | 2,93 | 109 | 14 | 110 | 86,925 |
| 111 | 16 | 112 | Consumers behaviour towards bee products consumption in the centre distric of kahramanmaras | 113 | Aytop, Y., Akbay, C., & Meral, H. (2019) 114 *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi* | 115 | 0 | 116 | 5 | 117 | 85 |
| 118 | 17 | 119 | Perfil dos consumidores do mel de Apis mellifera em Ubaíra-BA | 120 | Santos, C. R., de Souza Santos, J., Santos, D. R., dos Santos, M. R., & do Nascimento, G. R. (2020) 121 *Agropecuária científica no semiárido* | 122 | 1,07 | 123 | 2 | 124 | 83,07 |
| 125 | 18 | 126 | Comparative study of the quality of traditional honey and industrial honey | 127 | Gropoşilă-Constantinescu, D., Popa, G., Vişan, V. L., Mărgărit, G. L., Toma, R. C., & Barba, D. (2020) *128 Scientific Bulletin. Series F. Biotechnologies* | 129 | 0,67 | 130 | 2 | 131 | 82,67 |
| 132 | 19 | 133 | Consumer preferences regarding national and EU quality labels for cheese, ham and honey: The case of Slovenia | 134 | Kos Skubic, M., Erjavec, K., & Klopčič, M. (2018) 135 *British Food Journal* | 136 | 2,52 | 137 | 19 | 138 | 81,518 |
| 139 | 20 | 140 | Consumer's behavior towards honey purchase – a case study in Romania | 141 | Popescu, A., & Guresoaie, I. (2019) 142 *Scientific Papers Series Management Economic Engineering in Agriculture and Rural Development* | 143 | 0,79 | 144 | 5 | 145 | 75,787 |

| 1 | Number | 2. | Article Name | 2 | Authors | 3 | FI | 4 | CI | 5 | Ordinatio |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 146 | 21 | 147 | Trends in honey purchase and consumption in trás-Os-Montes region Portugal | 148 | Ribeiro, M. I. B., Fernandes, A. J. G., Do Cabo, P. S. A., & Diniz, F. J. L. D. S. (2019) | 150 | 1,26 | 151 | 4 | 152 | 75,26 |
| | | | | 149 | *Экономика региона* | | | | | | |
| 153 | 22 | 154 | Segmentation of honey buyers' behaviour by conjoint analysis | 155 | Šánová, P., Svobodová, J., Hrubcová, B., & Šeráková, P. (2017) | 157 | 0,61 | 158 | 17 | 159 | 67,605 |
| | | | | 156 | *Scientia Agriculturae Bohemica* | | | | | | |
| 160 | 23 | 161 | Conditions of honey consumption in select regions of Poland | 162 | Kowalczuk, I., Jeżewska-Zychowicz, M., & Trafiałek, J. (2017) | 164 | 1,72 | 165 | 15 | 166 | 66,72 |
| | | | | 163 | *Acta Scientiarum Polonorum Technologia Alimentaria* | | | | | | |
| 167 | 24 | 168 | An empirical examination of consumer preferences for honey in Croatia | 169 | Brščić, K., Šugar, T., & Poljuha, D. (2017) | 171 | 1,84 | 172 | 13 | 173 | 64,835 |
| | | | | 170 | *Applied Economics* | | | | | | |
| 174 | 25 | 175 | Research of honey consumers' behavior in province of Vojvodina | 176 | Ćirić, M., Ignjatijević, S., & Cvijanović, D. (2015) | 178 | 4,49 | 179 | 26 | 180 | 60,489 |
| | | | | 177 | *Економика пољопривреде* | | | | | | |
| 181 | 26 | 182 | Profile of consumers of beekeeping products and commercial establishments in the municipality of Garanhuns - PE | 183 | Correia, L. P. de B., Pinto, M. S., Galindo, G. M., de Oliveira, P. de A., & Milfont, M. de O. (2017) | 185 | 4,89 | 186 | 0 | 187 | 54,89 |
| | | | | 184 | *Revista Brasileira De Agrotecnologia* | | | | | | |
| 188 | 27 | 189 | Physcal chemical characterization phenolic content and consumer preferences of A.mellifera honey in southern jalisco México | 190 | Tapia-Campos, E., Castañeda-Saucedo, M. C., del Pilar Ramírez-Anaya, J., Macías-Macías, J. O., Barajas-Pérez, J. S., Tapia-González, J. M., & Alaniz-Gutierrez, L. (2017) | 192 | 0,4 | 193 | 4 | 194 | 54,396 |
| | | | | 191 | *Interciencia* | | | | | | |
| 195 | 28 | 196 | Honey consumption trends in Bragança, Portugal | 197 | Ribeiro, M. I., & Fernandes, A. (2018) | 199 | 0,98 | 200 | 3 | 201 | 43,98 |
| | | | | 198 | *Estudos de Gestão e Empreendedorismo* | | | | | | |

| 1 | Number | 2. | Article Name | 2 | Authors | 3 | FI | 4 | CI | 5 | Ordinatio |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 202 | 29 | 203 | Bee honey production chain: alternative source of income generation for small producers and physical-chemical quality of honey | 204 | Queiroga, C. F. M. A., Leite Filho, F. G., Machado, A. V., & Costa, R. D. O. (2015) | 206 | 4,89 | 207 | 7 | 208 | 41,89 |
| | | | | 205 | *Revista Brasileira de Agrotecnologia* | | | | | | |
| 209 | 30 | 210 | Consumer Purchase Intentions and Honey Related Products | 211 | Yeow, S. H. C., Chin, S. T. S., Yeow, J. A., & Tan, K. S. (2014) | 213 | 3,29 | 214 | 11 | 215 | 34,29 |
| | | | | 212 | *Journal of Marketing Research & Case Studies* | | | | | | |
| 216 | 31 | 217 | Factors influencing consumer behavior relating to the purchasing of honey part 1. The buying process and the level of consumption | 218 | Roman, A., Popiela-Pleban, E., & Kozak, M. (2013) | 220 | 0,78 | 221 | 23 | 222 | 33,78 |
| | | | | 219 | *Journal of Apicultural Science* | | | | | | |
| 223 | 32 | 224 | Perceptions and trends related to the consumption of honey: A case study of North-West Romania | 225 | Pocol, C. B., & Bolboacă, S. D. (2013) | 227 | 3,87 | 228 | 18 | 229 | 31,868 |
| | | | | 226 | *International Journal of Consumer Studies* | | | | | | |
| 230 | 33 | 231 | Preferences of the population of the greater Aracaju (SE) metropolitan region regarding the consumption of beekeeping products | 232 | Dantas, P. C., Correia-Oliveira, M. E., Poderoso, J. C. M., Gonçalves, F. B., Ferreira, A. F., Ribeiro, G. T., & Araújo, E. D. (2009) | 234 | 0,6 | 235 | 7 | 236 | 17,6 |
| | | | | 233 | *Scientia Plena* | | | | | | |
| 237 | 34 | 238 | Study on the use of bee honey associated with medicinal plants in the Várzea Comprida dos Oliveiras community, Pombal, Paraíba | 239 | de Andrade, S. E. O., Maracaja, P. B., da Silva, R. A., Freires, G. F., de Macena Pereira, A., & de Albuquerque Fernandes, A. (2012) | 241 | 1 | 242 | 3 | 243 | 3,997 |
| | | | | 240 | *Agropecuária científica no semiárido* | | | | | | |

Table 2 presents the articles and their respective objectives briefly described.

**Table 2**

*Articles selected by the Methodi Ordinatio and its objectives*

| N | 244 úmero | Nome do Artigo | 245 | 246 Objetivos |
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| 1 | 247 | Attitudes towards honey among Italian consumers: a choice experiment approach | 248 | 249 This study analyzed consumer perceptions about organic and local honey in Serbia, identifying factors affecting their willingness to pay (PAD). Consumers were more inclined to pay for organic honey compared to the site. Factors such as family income, schooling, and honey attributes positively influenced PAD. The perceived importance of aspects such as food safety and community support affected PAD by organic honey, while frequency of purchase, recommendations and attributes such as environmental care and nutritional properties influenced PAD by local honey. These results have implications for honey product marketing strategies. |
| 2 | 250 | The Current Situation on the International Honey Market | 251 | 252 This article addresses the biological aspects that make honey a unique product, the regulations related to its purity and the common forms of adulteration. It then provides statistical data on the global trade in honey, describing current trends and regional differences, with the aim of identifying possible irregularities. Such statistical information can be used by the authorities to investigate and combat honey adulteration more effectively. |
| 3 | 253 | The impact of packaging design on the perceived quality of honey by brazilian consumers | 254 | 255 This study created and validated a scale to assess consumer perception of honey, and investigated the impact of packaging design on perceived quality and purchase intent. Brazilian consumers (n = 343) answered 21 questions. Consumers have linked honey to healthy properties and safety, preferring honey from direct producers. Glass packaging was perceived as healthier, more tasty, of higher quality and reliable origin, as well as being considered more practical and sustainable. |
| 4 | 256 | Analysis of Consumers' Willingness to Pay for Organic and Local Honey in Serbia | 257 | 258 The study investigated consumer perceptions about organic and local honey in Serbia, aiming to understand the factors influencing the willingness to pay. The results highlighted that consumers tend to pay more for organic honey, being influenced by socioeconomic characteristics and attributes of honey. Family income and importance to food security positively affect the willingness to pay for organic honey. Buying recommendations and environmental concerns also positively influence the willingness to pay for local honey. These observations can guide pricing strategies, as well as the strengthening of the beekeeping industry. |
| 5 | 259 | Consumers' attitu de towards honey consumption for its health benefits: first insights from an econometric approach | 260 | 261 The study analyzed 640 Italian consumers and their honey consumption for health reasons. About 66% of respondents reported consuming honey for its beneficial properties. Key drivers include color and origin certification. The predisposition to honey consumption for health was influenced by characteristics such as age, sex, BMI and purchasing patterns. These results have important implications for public health and nutrition policies, emphasizing the importance of the functional properties of food. |
| 6 | 262 | Physicochemical properties, mineral content, antioxidant activities, and microbiological quality of Bupleurum spinosum Gouan honey from the middle atlas in Morocco | 263 | 264 The study evaluated monofloral honeys (Bupleurum Spinosum) from the Moroccan Middle Atlas, examining several physico-chemical parameters. Potassium was observed to be the most prevalent mineral, followed by sodium and calcium. All samples exhibited high antioxidant activity, correlated with phenols, flavonoids and ascorbic acid. As for health safety and quality, all samples were negative for microorganisms, indicating good quality. In summary, the study concluded that all samples have favorable physico-chemical properties, high antioxidant activity and |

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| | | | acceptable microbiological status, meeting international quality control standards. |
| 7 | 265 | Honey 266 Consumption of Individuals and Reasons for Preference Zara Honey That a Local Product (Sivas Provincial Center District) | 267 This research investigated the consumption of honey and its sociodemographic characteristics in Turkey, a major honey producer. A total of 272 residents were interviewed, revealing that 98.53% consume honey, most of whom prefer comb honey. The reasons for this preference were analyzed in 17 factors. Monthly income and health were identified as significant influences on local honey consumption. The analysis also showed that sex had a positive impact, while age had a negative impact. Based on these results, it is suggested that honey producers in Zara increase the appeal of the product with advertising and prioritize quality to increase customer satisfaction and profits. |
| 8 | 268 | Perception 269 regarding honey consumption in the state of Roraima | 270 270 The research examined the consumption of honey in Roraima, a region little studied in this aspect. An online questionnaire was conducted in 2021 with 340 participants, predominantly women aged 21 to 30 and with incomplete tertiary education. The frequency of honey consumption was low, with price and health concerns being the main reasons for this. Although most consider honey to be food, the propaganda encouraging its consumption was little seen. The research highlights the need for marketing improvements to increase honey consumption, highlighting the importance of quality for consumer health. |
| 9 | 271 | Total brood 272 removal and other biotechniques for the sustainable control of Varroa mites in honey bee colonies: economic impact in beekeeping farm case studies in northwestern Italy | 273 This study investigated the economic impact of total pup removal (TBR) as a technique for controlling Varroa mites in honey bee colonies, comparing it with other common practices, including chemical control. The results showed that the adoption of TBR led to an increase in total revenue, although it required more labor and could result in loss of honey production. While total costs have increased with TBR, advantages such as avoiding synthetic acaricides and promoting bee populations can make apiaries more resilient over time. |
| 10 | 274 | Food packaging 275 design and consumer perception of the product quality, safety, healthiness and preference | 276 The study investigated how packaging design influences consumers' perception of food. In a survey of 547 Lebanese adults, protection and security were found to be crucial. Vacuum packaging was seen as healthier and of better quality, while glass bottles were preferred for juices. Transparency was valued by those concerned with security. Most consumers consider nutrition and health claims to be important and are willing to pay more for better packaging. These findings will guide manufacturers in creating packaging aligned with consumer preferences, potentially increasing sales and influencing business decisions. |
| 1 | 277 1 | Profile of honey 278 consumers in open-air markets in Porto Seguro, Bahia, Brazil | 279 This study investigated the profile of honey consumers in Porto Seguro, Bahia, through 227 interviews at local fairs. Around 31.3% do not consume honey, while 68.7% consume it due to its taste or because they consider it healthy. Most purchase 1-3 liters of honey per year and prefer to consume it fresh. Factors such as color, appearance and flavor influence the purchase, with preference for honey from local producers or open-air markets. Respondents agree that honey tastes good and is beneficial to health, but there is disagreement about its price and the reliability of supermarket honey. It is concluded that promotional strategies must emphasize their health and local/regional origin, investing in quality information for consumers. |
| 1 | 280 2 | Profiles of honey 281 producers, traders and | 282 The study analyzed the sale of honey in open-air markets in Barreiras, Bahia, and the profile of consumers, traders and producers. It was discovered that 43.6% of consumers prefer to buy directly from producers, prioritizing origin and quality, although 60% of the products purchased did |

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| | | consumers in the city of Barreiras – Bahia | not have labels, despite the importance attributed to them by consumers. Honey storage conditions at markets were inadequate, with inappropriate packaging and exposure to sunlight. Although many producers participated in courses on Good Food Manufacturing Practices, the application of this knowledge was limited. This highlights the need for improvements in the commercialization and quality of honey at fairs. |
| 1 | 2833 | Consumer behaviour towards honey products in Western Australia 284 | 285 The study examines the factors that influence consumers' choices when purchasing honey in retail stores in Perth, Western Australia. Honey has been found to be used in a variety of ways, including as a sweetener in cereals and porridge, as well as in marinades, cakes, biscuits and drinks. The main purchasing determinants are brand reputation, origin and cost-benefit. Notable differences were observed between Anglo-Saxon and Asian consumers, indicating significant variations in consumption patterns between these demographic groups. |
| 1 | 2864 | Honey: food or medicine? A comparative study between Slovakia and Romania. 287 | 288 The article analyzed the profile of honey consumers in Slovakia and Romania, aiming to support honey producers and promote their consumption. A survey was conducted with more than 2,000 participants in each country. The analysis identified consumer segments with different consumption patterns, demographic profiles and preferences. Although there are similar segments in both countries, their consumption preferences vary. These findings provide valuable information for honey producers, helping them adjust their marketing strategies for different consumer segments. |
| 1 | 2895 | Quality Determinants and Effect of Therapeutic Properties in Honey Consumption. An Exploratory Study on Italian Consumers 290 | 291 This study investigates the determinants of honey consumption by Italian consumers, exploring how the therapeutic properties of honey influence their choices. The results indicate that therapeutic properties, followed by income, variety and flavor, play an important role in consumer behavior. This suggests that effective marketing strategies can be developed to communicate the therapeutic benefits and quality attributes of honey to Italian consumers, providing valuable insights for producers and traders. |
| 1 | 2926 | Consumers behaviour towards bee products consumption in the centre distric of kahramanmaras 293 | 294 The study investigates consumer behavior and factors that impact the purchase of beekeeping products in Kahramanmaras. Based on data from a survey of 270 consumers, it was found that the majority prefer honey, with 28.5% consuming it daily, and that they prefer to buy from local producers and markets. Sex, income, family size and diabetes influence the amount of honey consumption, while marital status, age and education level did not demonstrate a significant impact. |
| 1 | 2957 | 296 Profile of consumers of Apis mellifera honey in Ubaíra-BA 296 | 297 This study aimed to identify the socioeconomic profile and factors that influence honey consumers from Apis melliferas bees. 392 questionnaires were administered directly and randomly. The results revealed that the majority of interviewees consume honey, with variation in relation to age group, education level and family income. Consumption associated with the treatment of illnesses was higher among the youngest and most educated, while it was lowest among those with lower family income. The frequency of honey consumption is linked to the place of acquisition, preferably at fairs, directly from producers or in markets. |
| 1 | 2988 | Comparative study of the quality of traditional honey and industrial honey 299 | 300 The study analyzed traditional and industrial honeys, evaluating their sensorial, physicochemical and microbiological characteristics. All types were considered to be of high sensorial quality and free from microbial contamination. Commercial samples showed a slightly higher pH than traditional ones. Traditional sunflower honey was the most viscous, while commercial sunflower honey was the least viscous. In relation to reducing |

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| | | | sugars, industrial sunflower honey had the highest content, while traditional lime honey had the lowest. |
| 1 | 3019 | 302 Consumer preferences regarding national and EU quality labels for cheese, ham and honey: The case of Slovenia | 303 The study analyzes preferences of Slovenian consumers for cheese, ham and honey with national and EU labels, considering price and origin. 650 online consumers were interviewed, revealing price as the main influencer for cheese and honey, while origin is crucial for ham. Labels are less important. National products are preferred. Age and gender differences were observed. The need to promote local and EU products to boost preferences in Slovenia stands out. |
| 2 | 3040 | 305 Consumer's behavior towards honey purchase – a case study in Romania | 306 The study investigated honey purchasing behavior by interviewing 196 people at the National Honey Fair in Bucharest. Married individuals, over 45 years old, with secondary or higher education and with a higher monthly income tend to buy more honey. Polyfloral and acacia honey are preferred, mainly consumed for breakfast or as medicine. Purchases occur mainly directly from beekeepers and honey markets. Price, type, packaging and color of honey are essential factors in the purchasing decision. Beekeepers and honey fairs are crucial sources of information. It is concluded that beekeepers must adjust their marketing strategies to better meet consumer demands and take advantage of high-quality honey production in Romania. |
| 2 | 3071 | 308 Trends in honey purchase and consumption in trás-Os-Montes region Portugal | 309 This study investigated the determinants of the decision to purchase and consume honey among consumers in the city of Bragança. A sample of 474 individuals was analyzed, of which 399 were honey consumers. Significant factors in the purchasing decision included flavor, color, origin and certification label, explaining 68.9% of the consumer's decision to purchase honey. Non-consumers valued the certification seal when purchasing the product to offer to someone, while consumers considered flavor, color and country of origin as important aspects in decision-making. |
| 2 | 3102 | 311 Segmentation of honey buyers' behaviour by conjoint analysis | 312 This study analyzes the behavior of Czech consumers when purchasing honey, considering price, origin, type, crystallization and organic quality. Target groups were interviewed in Prague and the Central Bohemian region, focusing on education level. The results show that consumers prioritize price and origin of honey, with crystallization being an important factor in the perception of quality. Cluster analysis identified two groups: one focused on origin, type and price/crystallization, and another interested in origin, price and organic quality. |
| 2 | 3133 | 314 Conditions of honey consumption in select regions of Poland | 315 This study analyzed the habits and preferences of Polish consumers in relation to honey. The results showed regular consumption, driven by the health benefits and variety of culinary uses. Purchases are often made in apiaries and open-air markets, with preference for types such as lime, polyfloral and acacia, considering price and color. Honey is mainly used as food and less used in medicine and cosmetics. Sociodemographic factors and nutritional knowledge influence consumer habits, highlighting the need for nutritional education and marketing strategies to increase honey consumption. |
| 2 | 3164 | 317 An empirical examination of consumer preferences for honey in Croatia | 318 The study sought to understand consumer preferences in relation to honey and their opinions on labeling. Results from a survey of 1,008 respondents revealed a preference for mild-tasting, bright-colored honey, especially acacia honey. The majority of respondents buy honey directly from producers, mainly motivated by the health benefits. These findings fill gaps in knowledge about consumer preferences and can guide marketing strategies for local beekeepers in Croatia. |

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| 2 | 3195 | Research of honey consumers' behavior in province of Vojvodina | 321 This study aims to help honey producers in the Vojvodina region, especially lime honey producers from Fruska Gora with geographical origin protection, to understand the motives, attitudes and purchasing habits of honey consumers in the region. The results obtained offer insights into what type of honey consumers buy, why, where, when and how often. The conclusion includes guidance for improving marketing strategies and marketing programs for honey producers. |
| 2 | 3226 | Profile of consumers of beekeeping products and commercial establishments in the municipality of Garanhuns - PE | 324 This study sought to evaluate the profile of consumers and commercial establishments of bee products in Garanhuns-PE. 150 people and 22 establishments were interviewed. Honey and propolis are the best known and consumed products, while royal jelly and wax are less known and used. Bee pollen and apitoxin have practically no use. The availability and variety of products in commercial establishments are inconsistent. It is concluded that it is necessary to promote and encourage the consumption and use of beekeeping products. |
| 2 | 3257 | Physcal chemical characterization phenolic content and consumer preferences of A.mellifera honey in southern jalisco México | 327 The study carried out in the south of Jalisco, Mexico, characterized honey and identified consumer preferences. Of the consumers surveyed, 88% consume honey, mainly for its health benefits, preferring amber tones and liquid consistency. Most purchase honey directly from producers and are willing to pay between US$3.33-4.44 per liter. It was concluded that the honey studied has adequate quality for commercialization in international markets, which could boost the regional economy. |
| 2 | 3288 | Honey consumption trends in Bragança, Portugal | 330 This study analyzed the profile and consumption habits of honey in Bragança, Portugal. The majority of consumers were between 25 and 64 years old, female, with higher education and working. There were statistical differences between honey consumers and non-consumers in relation to professional status and family income. The preference was for national honey, consumed in autumn/winter, mixed with food or as medicine. Larger packaging, especially labeled glass jars, was preferred, and the average price considered fair was 3.9 euros per kilogram. |
| 2 | 3319 | Bee honey production chain: alternative source of income generation for small producers and physical-chemical quality of honey | 333 Global production of bee honey is on the rise, especially in Brazil, with an emphasis on organic honey from the Northeast. Previously obtained through predatory extraction, honey has historically been used as a source of energy since prehistoric times, causing damage to local ecosystems. However, with more sustainable management techniques, beekeepers protect the environment and find a new source of income, especially in family farming. |
| 3 | 3340 | Consumer Purchase Intentions and Honey Related Products | 336 The study investigated the factors that affect the purchase intention of honey-related products, considering its role in health, household use and beauty, and its impact on economic growth. Despite the challenges in production and preservation, product quality is essential for success. With increasing demand, understanding consumer needs is crucial to ensuring customer satisfaction and loyalty. From the 200 questionnaires collected, it was concluded that medical condition, quality, brand reputation and price influence purchasing intentions. |
| 3 | 3371 | Factors influencing consumer behavior relating to the purchasing of honey part 1. The buying process and the level of consumption | 339 The study aimed to identify the main factors that influence consumer honey purchasing behavior. The results showed that honey meets several nutritional, gustatory, prophylactic and medicinal needs. Purchasing decisions are influenced by economic factors and knowledge about the value of honey. Psychological and social determinants also play a role in choosing between honey varieties. More than 60% of respondents considered the price of honey to be high or very high, and purchasing directly from the beekeeper |

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| | | | was common. Some interviewees did not consume honey, but price reductions and the opportunity to taste it at the point of sale could encourage them. |
| 3 | 3402 | Perceptions and trends related to the consumption of honey: A case study of North-West Romania | 341 342 The research investigated honey purchasing and consumption trends in the Northwest region of Romania, where there is a tradition in production but low consumption. Using a questionnaire, consumers' consumption, perceptions and sociodemographic data were analyzed. Honey was widely considered delicious and beneficial to health, with factors such as education, profession and age influencing this perception. There was a preference for local honey and more confidence in national honey. Although the frequency of consumption was high, the per capita quantity consumed was low. Local producers are encouraged to promote domestic consumption by educating consumers about a healthy lifestyle. The research highlights the importance of quantitative and qualitative information to improve marketing strategies. |
| 3 | 3433 | Preferências da população da região metropolitana da grande Aracaju (SE), sobre o consumo de produtos apícolas | 344 345 The study investigated the profile of consumers of beekeeping products, given the need to explore the Brazilian domestic honey market, especially after the embargo on exports to the European Union in 2006. 534 people were interviewed in Aracaju and São Cristóvão. The results indicate a lack of knowledge about the benefits of bee products, as well as their processing and safe ways of purchasing, highlighting the importance of clarifying these aspects for consumers. |
| 3 | 3464 | Study on the use of bee honey associated with medicinal plants in the Várzea Comprida dos Oliveiras community, Pombal, Paraíba | 347 348 The study aimed to use bee honey with medicinal plants in the Várzea Comprida dos Oliveiras community, Pombal, Paraíba, Brazil. Data were obtained through home visits and interviews (questionnaires) with 40 residents. Six species of bees were mentioned for the treatment of diseases, with the Africanized bee (Apis mellifera) being the most used. The most common method of use was licking (homemade syrup), with lemon, orange and mint being the plants most associated with honey, especially for respiratory illnesses such as flu and colds. |

The analysis of the articles listed in Tables 1 and 2 revealed that these studies offer a comprehensive view of the global apiculture market, exploring the perceptions of producers and consumers regarding the willingness to pay for different types of honey, whether organic or traditional, and how these perceptions affect marketing strategies. Topics such as the quality of honey, the regulations that guarantee its purity, and the challenges faced due to concerns such as adulteration of products were also addressed.

Another aspect discussed is the design of the packaging of the products, evidencing how it influences the perception of the consumer about the quality of the honey and its intention to purchase. The studies also provided detailed profiles of consumers, highlighting their consumption habits, purchasing preferences, and the factors influencing their decisions.

Among the selected articles, issues related to the quality and food safety of products marketed by producers (beekeepers) were also addressed. Some authors presented analyzes of the physico-chemical and microbiological properties of the product. In addition, the economic

impacts of different beekeeping practices, such as the total removal of offspring, were examined in comparison with more common methods, such as chemical control, adopted by beekeepers.

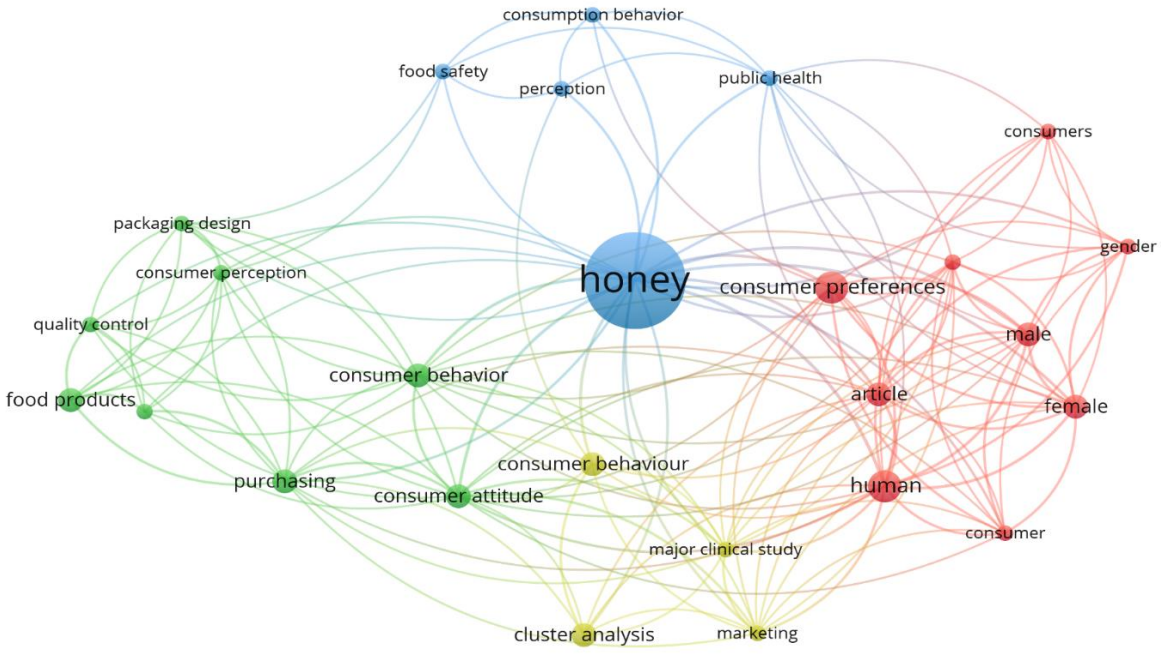
The research presented extends to several regions of the world, investigating consumer behavior and purchasing preferences in countries such as Brazil, Turkey, Slovakia, Romania, Mexico and Portugal, among others.

Finally, the traditional uses of honey in alternative medicine are explored, revealing its importance in various communities and cultures. In short, these studies offer a broad and in-depth view of the honey market, addressing both consumer aspects and quality issues, regulations and production practices, carried out by producers (beekeepers).

In Figure 1, the articles selected through Methodi Ordinatio were processed and submitted to VosViewer® software. A co-occurrence analysis was conducted using all the keywords of the selected articles, resulting in the identification and separation of the themes into four main clusters.

**Figure 1**

*Co-occurrence analysis performed by VosViewer® software*




The predominant theme and main axis is the word "honey", located in the blue cluster, which represents a view on food safety and public health in general. The studies covered in this area aimed to understand the consumption behavior related to these factors of concern for health in general, addressing nutritional aspects and healthy eating.

The red cluster focuses on social issues and their influence on consumer preferences and behaviors. Specifically, it explores gender issues, including the distinctions between female and male consumers, and how these differences shape purchasing decisions. In addition, it examines the role of buyers within this social context, highlighting how their experiences, values and perceptions influence consumer choices.

In the green cluster, the main topic addresses product formulation relationships, especially with regard to packaging, and how this influences consumer perception and their purchasing decisions. In this context, several variables are analyzed in order to understand what motivates consumers to purchase a given product. This covers everything from product quality aspects, which are influenced by packaging, to how consumers perceive honey as a commercial product.

The yellow cluster is dedicated to the marketing analysis of the various aspects previously mentioned, with emphasis on clinical work and the use of other cluster analyzes related to the theme. The main focus is to understand how consumers perceive the product and use these insights to guide sales-oriented marketing programs, based on work and research designed specifically for this purpose. This approach seeks to integrate information gained from research into food safety, consumer preferences, product formulation, and other relevant aspects in order to develop more effective and targeted marketing strategies.

From the comparative analysis of the articles carried out using the Methodi Ordinatio (M.O.), a significant amount of perspectives related to the global honey market were observed, focusing both on consumer preferences, as well as the characteristics of the products and the practices of consumption and production of apiculture products in various regions of the world. It is important to note that each study offers valuable information and that can inform certain specific strategies for producers (beekeepers), for traders, as well as marketing professionals in the beekeeping industry.

From the contextual data presented from the Vojvodina region, where an urgent understanding of consumer behavior is needed, especially in Fruska Gora, which is considered the most productive area of that region. Local preference is for acacia honey and the way of purchase is through direct purchase from local producers, with honeys being clear, the preferred ones by Croatian consumers (BRŠČIĆ et al., 2017). This preference points in a direction for local producers, in order to supply the information as the intrinsic attributes of the honey marketed, besides highlighting the quality and food safety of these products, in the process of strategic marketing for a more efficient marketing of these products (ĆIRIĆ et al., 2015).

Another study by Vapa-Tankosić et al. (2020) in the Republic of Serbia, it showed the willingness of consumers of apiculture products to pay more for organic honey, which suggests, in a way, an increasing trend compared to natural products such as agro-ecological and organic products. Price (cost) formation strategies were carried out in addition to the promotion of these products, which should align with these emerging preferences.

In an Italian study, conducted by Cosmina et al. (2016), the heterogeneity in the preferences for the type of honey produced was observed, and among the types marketed, organic honey and the preference for acquisition in local fairs, were very significant aspects in the referenced research. According to these researchers, effective communication between producer and consumer is very effective for the producers, since they help these beekeepers in the way of producing these products together with the mechanisms of marketing and information strategies.

The global growth of the honey production chain, especially in Brazil, is remarkable. However, the evolution of the beekeeping sector is slow, however, with the growing increase in demand for healthy and sustainable food, it has led producers to see in beekeeping an extra and sustainable income alternative (BALBINO et al., 2015). This is a fact that, in the Northeast region, a great search for more sustainable practices is observed, promoting great opportunities for these producers and, consequently, their concern to create marketing strategies that promote sustainability to consumers (ALVES et al., 2021; DE NOVAIS et al., 2021; CORREIA et al., 2017).

In relation to research on the nutritional and therapeutic properties of honey and other apiculture products, both in Europe and Brazil, they reflect the growing value of these products not only as food, but also as a product that provides benefits to the health of consumers (ŠEDÍK et al., 2019; DE ANDRADE et al., 2012). It is interesting to note that in most studies carried out, marketing strategies are always evident alongside the concern of producers, to publicize the benefits of products in order to attract health-conscious consumers (ALVES et al., 2021; GARCIA, 2018; BOU-MITRI et al., 2021).

In Poland, a study by Kowalczuk et al. (2017), in relation to consumer practices in that region, revealed in detail the consumer practices in that region, informing marketing strategies adapted to the preferences of local consumers. In Australia (BATT et al., 2012) and Slovenia (KOS SKUBIC et al., 2018), it was noted that consumer preferences for products labeled with the geographical indication of production, and the specification of being protected from external actions that may interfere with the quality of apiculture products, underline the great importance of producers carrying out origin and price identification in the purchasing decision process.

This is also observed in Poland (KOWALCZUK et al., 2017), where the strategies used by producers are also based on marketing tailored to local preferences, which also highlights the importance of informing the origin and price formation of these products.

In Romania, the link between demographic characteristics and purchasing behavior of apiculture products has been observed, indicating the need to adapt marketing strategies (POCOL et al., 2013).

Overall, these studies highlight the complexity and diversity of the beekeeping market, highlighting, in particular, the importance in relation to product quality, in addition to regional preferences, and also the need for flexible marketing strategies in order to meet the growing expectations of consumers in relation to the product in question (RIBEIRO et al., 2018; RIBEIRO et al., 2019; GARCIA, 2018).

Studies such as those carried out in Várzea Comprida das Oliveiras, Brazil (DE ANDRADE et al., 2012) and in Kirklareli, Turkey (İLKAY et al., 2023) explore consumption practices in specific communities and offer important information in relation to traditional applications and specific preferences of local consumers. The association of honey and its apiculture products with medicinal practices highlights the importance of consumer awareness of the health benefits of the product (LAAROUSSI et al., 2020; ZANCHINI et al., 2022).

In the regions of Slovakia (GUZIY et al., 2017) and Romania (ŠEDÍK et al., 2013), approaches have been observed that have provided researchers with a deeper understanding of consumer preferences and behavior in each of these countries. Such a study is of paramount importance as it allows producers to adapt marketing strategies according to local cultural and religious requirements (ROMAN et al., 2013).

In Brazil, a research in Roraima, highlighted the need, also, for marketing strategies to be carried out by producers of apiculture products, aimed at increasing consumer awareness of the benefits promoted by both honey and apiculture products, especially among younger consumers (FERREIRA et al., 2022). Similarly, in the north-western region of Romania, a similar study was carried out indicating that there is a need to promote an increase in domestic consumption of apiculture products by educating these consumers to have a healthy lifestyle (POCOL et al., 2013).

In relation specifically to honey production, a study conducted in Italy by Mancuso et al. (2020), points out that the high production of apiculture products does not always translate into higher profits for producers. This highlights the importance of taking into account economic factors, as well as purchasing habits and social influences at the time of the decision of purchase by consumers, which highlights the great complexity of the beekeeping market.

In short, all these studies provide a comprehensive overview of the production and consumption of honey and the different apiculture products in different contexts, highlighting the importance of considering regional, cultural and economic factors in the promotion of this product. Awareness of the benefits of honey, targeted marketing strategies and the preservation of traditional practices, emerge as key elements in order to boost the consumption of these products in diverse communities. This information is valuable for all components of the beekeeping chain, from producers, traders, marketing professionals in the beekeeping industry to reaching the final consumer. This allows for an increasingly effective and adaptive approach to meeting the needs and preferences of constantly evolving consumers.

## 5 CONCLUSION

The studies compiled by the systematic review provide a comprehensive and diversified view of the production and consumption of honey and its derivatives in different scenarios, highlighting the importance of taking regional, cultural and economic aspects into account when promoting these products. Awareness of the benefits of honey, targeted marketing strategies and the preservation of traditional practices emerge as crucial elements to stimulate consumption in diverse communities. These discoveries are essential for all participants in the beekeeping chain, from producers to final consumers, facilitating more effective and adaptive approaches to meet the ever-changing demands of the market.

However, among all the points presented in the present research, some aspects were considered practically absent in the selected articles, being necessary to explore them in future research in the apiculture chain.

Issues such as sustainability of beekeeping, through research into sustainable practices in beekeeping, such as the use of organic methods, integrated pest management and conservation of natural habitats to promote the health of hives and the preservation of bees.

The biotechnology and genetics of bees, with the aim of exploring advances in biotechnology applied to beekeeping, including studies on bee genetics to better understand disease resistance, honey production and adaptation to different environments.

Bee health and disease management by investigating new strategies to prevent and control diseases affecting bees, as well as exploring alternative therapies to promote colony health.

The relationship between pollination and agriculture, from the study of the impacts of bee pollination on agriculture and ecosystems, including the assessment of pollination services, the role of bees in food production and the interactions between pollinators and plants.

Technology and innovation in beekeeping, in research on the development of new technologies for hive monitoring, apiary management and tracking of flight patterns of bees, aiming to improve efficiency and productivity in beekeeping.

The effects of climate change in order to assess the effects of climate change on bee populations, plant flowering patterns and availability of food resources, and to develop adaptation strategies to mitigate these impacts.

Research into bioactive compounds of honey to investigate the potential health benefits of bioactive compounds found in honey, including studies on their antioxidant, antimicrobial and anti-inflammatory properties, as well as their potential use in alternative medicine and cosmetics.

In addition, socio-economic aspects of agriculture, with the aim of studying the socio-economic impact of beekeeping on local communities, including analyzes of value chains, job creation, rural development and the role of beekeepers' cooperatives in promoting sustainable development.

Exploring these themes can contribute significantly to the advancement of knowledge and practices in the apiculture area, benefiting both producers and the environment.

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