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Geographical Indications of Teas and Infusion Beverages: A Systematic Literature Review

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1. Introduction

In various parts of the world, Geographical Indications (GIs) have played an increasingly prominent role in enhancing the value of agri-food products by granting official recognition to the geographical origin and specific qualities associated with specific territories (Barham, 2003; Giovannucci et al., 2009). Considered instruments for safeguarding local knowledge, promoting rural development, and enabling product differentiation in competitive markets, GIs have expanded across multiple agri-food segments, including cheese, wine, coffee, and, with growing prominence, tea and infusion beverages.

In the context of tea, the scientific literature has prioritized technical-scientific approaches focused on the authentication of geographical origin and traceability (Fatima & Voutyrakos, 2025; Ghosh et al., 2025; Deng et al., 2020; Firmani et al., 2019), as well as the chemical analysis of compounds (Gong et al., 2025; Ren et al., 2024; Fu et al., 2023; Zheng et al., 2023) applied to GIs. These studies, mostly conducted in Asian countries such as China and India – address physical and legal aspects related to quality control and the protection of designations. However, the geographical and disciplinary concentration reveals a still fragmented field, predominantly shaped by the natural and regulatory sciences, with limited engagement from the applied social sciences and little attention to the symbolic and communicational dimensions of these products.

Within this scenario, a theoretical and empirical gap becomes evident regarding the role of tea GIs as instruments of market differentiation, territorial branding, and the construction of perceived value by consumers. Few studies have systematically explored how geographical certification influences tourism, purchasing decisions, brand image, or the symbolic appreciation of the place of origin (Besky, 2014; Li et al., 2020; Liang & Lai, 2023; Li et al., 2025). Moreover, communication and positioning strategies, such as storytelling, GI-related tourism, and the use of digital media, remain underexplored in academic literature, particularly through quantitative methodologies. This mismatch between market complexity and scientific output becomes even more apparent when considering the lack of studies conducted in Latin American countries, especially Brazil, despite its rich biodiversity and strong tradition in infusions.

Bearing that in mind, this article seeks to answer the following research question: To what extent has the marketing dimension of teas protected by geographical indications been explored within academic literature? To address this question, a systematic review of the international scientific literature was conducted based on the Methodi Ordinatio protocol (Pagani et al., 2015), which allows for the classification and ranking of studies using objective criteria such as impact factor, year of publication, and number of citations. The analysis encompasses 78 articles published between 2007 and 2025, with no predefined time frame – starting from the earliest available study, allowing the mapping of trends, the identification of research gaps, and the proposal of directions for the advancement of the field.

By gathering and systematizing scientific output on tea GIs with a focus on their marketing dimension, this study contributes to the consolidation of a more integrated and interdisciplinary research agenda—one that is sensitive to market strategies, particularly in regions with underexplored potential. The goal is to provide theoretical and methodological insights for

researchers, policymakers, and economic agents interested in the strategic use of GIs as symbolic assets, competitive advantages, and drivers of sustainable development.

2. Theoretical Framework

2.1. Geographical Indications

Geographical Indications (GIs) refer to products from a specific location that possess unique characteristics resulting from natural environmental factors in their cultivation or from human influences in the production process. The term was formally introduced during the Uruguay Round (1986–1994), a multilateral trade negotiation involving 123 countries, culminating in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). A definition is provided in Article 22, Section 3, where GIs are described as "indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin." (TRIPS, p. 328).

Silva et al. (2024) emphasize that the registration of a GI grants a product a perception of quality and distinction, directly impacting the economic sphere. "In the current global economic landscape, the identification of products and services through GIs promotes regional development, adds value, and communicates dimensions of quality, typicity, tradition, and cultural heritage to the market" (Silva et al., 2024, p. 2, our translation).

The attributes highlighted by Silva et al. (2024) have also been reinforced by Bramley et al. (2009), who argue that consumers are increasingly concerned about the origin of products. According to the authors, this is driven by heightened attention to food safety and sociocultural trends related to interest in culinary heritage. "Thus, territorial origin becomes a strategic tool for differentiation in agri-food markets" (Bramley et al., 2009, p. 109, our translation).

From this perspective, Cerdan et al. (2014) reflect on other dimensions affected by GI protection for agri-food products: "The highlighted benefits include economic advantages (access to new domestic and export markets), social and cultural benefits (inclusion of disadvantaged producers or regions), environmental benefits (preservation of biodiversity and local genetic resources, and environmental conservation)" (Cerdan et al., 2014, p. 45).

From the discussion presented, it is clear that obtaining a GI registration is a strong market argument from economic, social, and historical-cultural standpoints.

2.2 The Importance of Communication and Marketing for Geographical Indications

Even in a context where product origin labeling already serves as a strong market argument, it becomes clear that it is not merely the GI registration itself that matters, but rather the actions taken thereafter. Covalchuck and Medeiros (2023) point out that although GI registration represents an economic instrument for value aggregation, it does not, by itself, lead to higher prices or increased market appreciation. According to the authors, economic progress depends on the cohesion of local relationships and the valorization of traditions, customs, knowledge, and other intangible assets linked to territorial identity – factors closely related to the development of marketing communication strategies tailored to GIs.

Public perception of a GI's image is a direct result of how it communicates its attributes, which in turn influences its market positioning. Silva et al. (2022) argue that GIs inherently carry a range of formative elements that must be communicated. Drawing on Aaker (1996) and Mindrut et al. (2015), the authors emphasize that the attributes selected by a brand and the way they are communicated are key to the construction of its image among consumers.

Cassago et al. (2021) reinforce that investing in communication and marketing strengthens the reputation of certified products and helps position them distinctively in the market – a statement corroborated by Penker et al. (2022), who highlight that strategies emphasizing origin, traditional production methods, and product qualities are essential for positioning in different market niches. On this matter, Gezer et al. (2024), in a recent systematic review of the literature, highlighted that the global demand for origin-recognized products is growing, but ensuring that consumers understand and can access these products remains a key challenge.

Rangnekar (2004), in a report published by ICTSD and UNCTAD, had already indicated that producers should develop communication campaigns that link their products to local development and environmental preservation, using distinct approaches for distant consumers. This perspective is echoed by Artêncio et al. (2019), who advocate for marketing actions aligned with the identity of GIs and developed in collaboration with public institutions, universities, and specialists – especially in Brazil, where the prevailing image is still largely associated with commodity production rather than high value-added products (Dinnie, 2016).

Thus, communication strategies become essential for promoting the attributes of GIs and consolidating their image—particularly in the premium segment. Maiorki and Dallabrida (2015) had already noted that mass media exposure could drive the consumption of differentiated products and contribute to territorial development. Castro and Giraldi (2018) point out that the reputation of a GI tends to be associated both with the number of businesses involved and with long-term marketing investment.

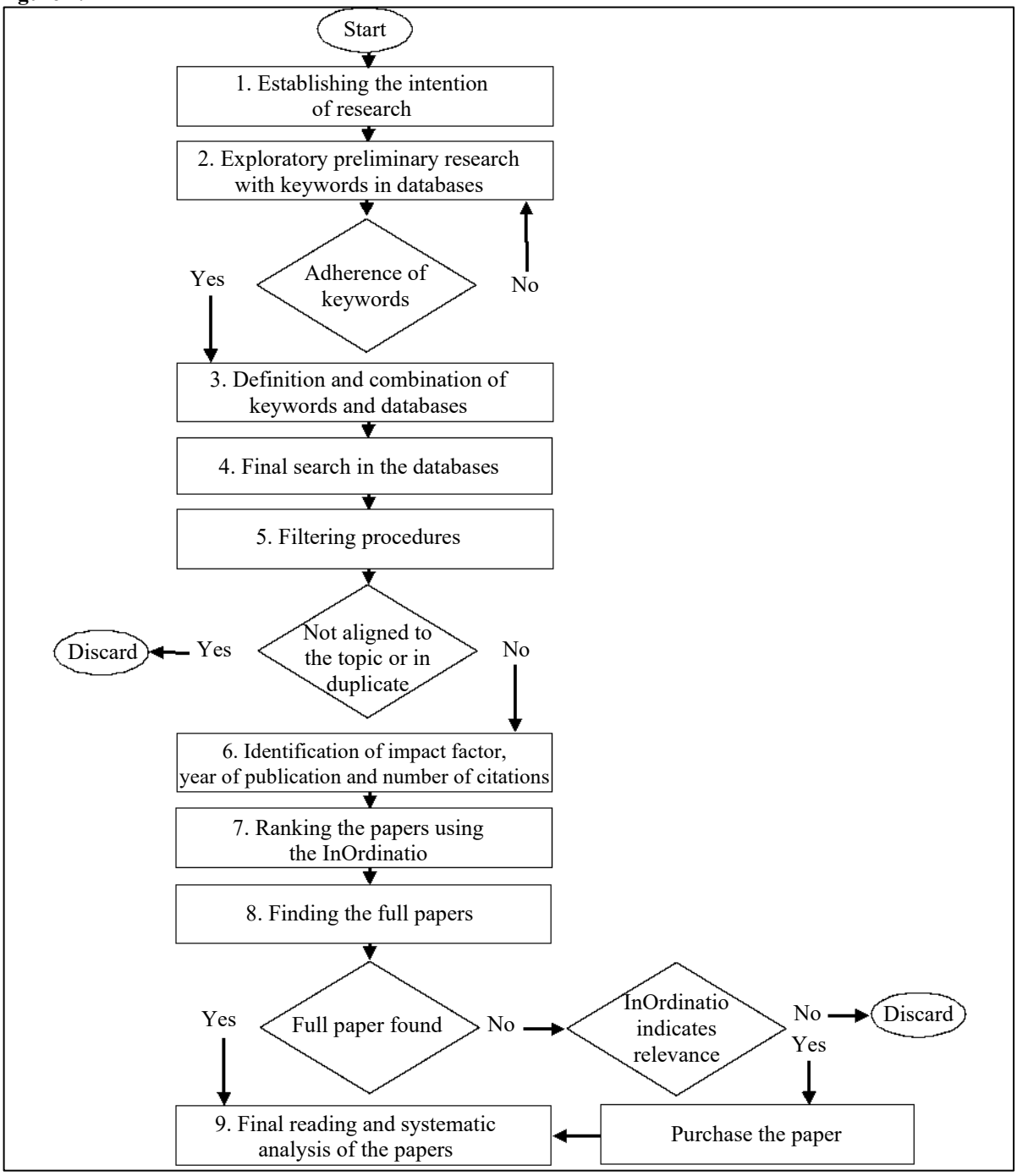
Taken together, these reflections point us toward a recent integrative review conducted by Silva et al. (2024), which posit that innovation in marketing and sales is a particularly promising avenue for advancing research on Geographical Indications. The authors emphasize the need for further studies that investigate how GIs adopt and implement innovative strategies to effectively communicate their distinctive attributes and enhance brand positioning in increasingly competitive markets. Building on this perspective – and in light of the conceptual and empirical gaps outlined throughout this chapter – the next section presents the methodological approach adopted in this study, which seeks to systematize and critically evaluate the current state of knowledge through a structured systematic literature review.

3. Methodology

To systematically map and analyze the existing Marketing literature on Geographical Indications, this study drew upon the Scopus database – widely recognized for its comprehensive coverage of peer-reviewed academic literature, and frequently used as the primary research citation data source by researchers from top universities and research institutes around the globe (Schotten, 2017). The data was collected in June and July 2025.

The analysis followed the Methodi Ordinatio protocol proposed by Pagani et al. (2015), as illustrated in Figure 1. In brief, Methodi Ordinatio provides a systematic approach for selecting and ranking scientific publications.

Figure 1. Methodi Ordinatio



Fonte: Pagani et al. (2015, p. 2122)

At greater length, the method adopts the InOrdinatio equation as a tool to prioritize academic literature based on relevance. This formula incorporates three central variables: the year of publication (to account for recency), the number of citations (as a proxy for scholarly influence), and the journal's impact factor (reflecting publication quality), as illustrated below:

$$InOrdinatio = \left(\frac{Impact\ Factor}{1000}\right) + \alpha * [10 - (ResearchYear - PublishYear] + (\sum Citations)$$

To calculate the index, the journal impact factor is normalized by dividing it by 1000 to align its scale with the other criteria. The recency of the research is incorporated using 'α' (alpha), a

weight assigned to the year of publication, which can range from 1 to 10 – set to 10 in this study to emphasize recency due to the increasing pace of new publications. Lastly, the total number of citations received by each article is added to the final score.

Thus, aiming for broad initial coverage, the preliminary search phase (steps 1 and 2 within the Methodi Ordinatio protocol) included keywords in English, Portuguese, Italian, and French – a choice informed by the longstanding tradition of Geographical Indications in countries where these languages are spoken. However, these multilingual queries did not return results aligned with the research objectives, requiring a more focused strategy that employed only English keywords for the final identification and retrieval of articles (steps 3 and 4). The search strings are shown in Table 1.

Table 1. Search strings in Scopus' database TIT-ABS-KEY field

"geographical indication"	**or**		
"designation of origin"	**or**		"tea"
"appelation of origin"	**or**		
"indication of provenance"	**or**	**and**	**or**
"territorial branding"	**or**		
"place-based product*"			"infusion beverage*"

Source: elaborated by the authors (2025)

At this point, 96 documents were found. It is worth noting that combining the keyword "infusion beverage" with the other keywords yielded no results – when used alone, however, it retrieved 15 documents, 9 of which were journal articles (which were not considered, as none referred to geographical indications).

Given that the Methodi Ordinatio protocol incorporates journal impact factors into its ranking criteria, books and book chapters were excluded from the analysis, resulting in a set of 82 journal articles. As the search was conducted using a single database, no deduplication was necessary (step 5). However, a thematic screening was performed to ensure relevance to the research question. Four articles were removed – one of them due to retraction – resulting in a final dataset of 78 articles.

Following the selection of articles, the next phase (step 6) involved collecting the specific metrics required for the Methodi Ordinatio classification. For each publication, the journal's impact factor was obtained through the Scimago Journal & Country Rank database; the total number of citations per article was verified using Google Scholar; and the year of publication – the third key criterion – was readily available in the metadata of each article. These three factors were then compiled for the subsequent ranking process.

4. Results

With all metrics gathered, the articles were ranked using the InOrdinatio equation (step 7), as presented in Table 2. The following steps involved retrieving the full texts from Scopus database (step 8) and conducting a final reading and systematic analysis (step 9). Articles originally written in Chinese (10 documents) were first translated with the assistance of the ChatGPT-4o language model (OpenAI, 2024) and Google Translate. Only six articles received negative InOrdinatio scores – indicating lower relevance according to the ranking criteria. They were included in the review nonetheless.

Table 2. InOrdinatio-ranked literature (Scopus) on “geographical indications” and “tea”

No.	Title	Year	Number of citations	Impact Factor	*InOrdinatio*
1	Near infrared (NIR) spectroscopy-based classification for the authentication of Darjeeling black tea	2019	163	174	203,174
2	Tea tourism: Designation of origin brand image, destination image, and visit intention	2023	67	81	147,081
3	Predictive geographical authentication of green tea with protected designation of origin using a random forest model	2020	94	174	144,174
4	Involvement, place attachment, and environmentally responsible behaviour connected with geographical indication products	2023	53	98	133,098
5	Fingerprinting black tea: When spectroscopy meets machine learning a novel workflow for geographical origin identification	2024	33	348	123,348
6	Institutionalizing Geographical Indications in Southern Countries: Lessons Learned from Basmati and Rooibos	2017	103	233	123,233
7	Authentication of the geographical origin of Guizhou green tea using stable isotope and mineral element signatures combined with chemometric analysis	2021	53	174	113,174
8	The labor of terroir and the terroir of labor: Geographical indication and Darjeeling tea plantations	2014	121	99	111,099
9	Characterization of the key volatile compounds in longjing tea (Camellia sinensis) with different aroma types at different steeping temperatures by GC–MS and GC–IMS	2024	15	187	105,187
10	Hyperspectral imaging combined with convolutional neural network for Pu'er ripe tea origin recognition	2025	2	148	102,148
11	Promoting LC-QToF based non-targeted fingerprinting and biomarker selection with machine learning for the discrimination of black tea geographical origin	2025	1	348	101,348
12	Discrimination of geographical indication of Chinese green teas using an electronic nose combined with quantum neural networks: A portable strategy	2023	21	248	101,248
13	From GI products consumers to destination visitors: an examination of the push side mechanism	2025	1	72	101,072
14	Enhanced understanding of dark tea quality through integrated GC-IMS and E-Nose analysis	2025	0	187	100,187
15	A machine learning method for the fine-grained classification of green tea with geographical indication using a mos-based electronic nose	2021	40	123	100,123
16	Beyond consumer willingness to pay: impact of geographical indications on greenhouse gas emissions	2025	0	67	100,067
17	Floral Characterization and Genetic Variation of Tea Germplasm Accessions of the Sub-Himalayan Region of West Bengal, India	2025	0	35	100,035
18	Geographical Indication (GI) Laws in India and Its Implementation: A Critical Appraisal	2025	0	16	100,016
19	Two sides of the same coin: the Darjeeling tea saga and the need to reform the legal protection of geographical indications	2025	0	14	100,014
20	Price Prediction of Pu’er tea based on ARIMA and BP Models	2022	27	146	97,146
21	Headspace solid-phase microextraction coupled with gas chromatography-mass spectrometry (HS-SPME-GC-MS) and odor activity value (OAV) to reveal the flavor characteristics of ripened Pu-erh tea by co-fermentation	2023	17	94	97,094
22	Collective intellectual property of Indigenous peoples and local communities: Exploring power asymmetries in the rooibos geographical indication and industry-wide benefit-sharing agreement	2023	16	301	96,301
23	Rapid authentication of Chinese oolong teas using atmospheric solids analysis probe-mass spectrometry (ASAP-MS) combined with supervised pattern recognition models	2022	25	174	95,174
24	Integrated bioinformatics and multiomics reveal Liupao tea extract alleviating NAFLD via regulating hepatic lipid metabolism and gut microbiota	2024	5	150	95,15
25	Combining bioinformatics and multiomics strategies to investigate the key microbiota and active components of Liupao tea ameliorating hyperlipidemia	2024	4	243	94,243
26	1H NMR Spectroscopy Combined with Machine-Learning Algorithm for Origin Recognition of Chinese Famous Green Tea Longjing Tea	2024	4	123	94,123
27	Assessing the role of geographical indications in affecting the quality of imports	2024	4	80	94,08
28	Aging-Accelerated Mouse Prone 8 (SAMP8) Mice Experiment and Network Pharmacological Analysis of Aged Liupao Tea Aqueous Extract in Delaying the Decline Changes of the Body	2023	12	133	92,133
29	Distinguishing tea stalks of Wuyuan green tea using hyperspectral imaging analysis and convolutional neural network	2024	2	28	92,028
30	Impact of Geographical Indications on Revitalisation of Local Economy: A Case Study of Darjeeling Tea	2024	1	16	91,016
31	The protection of agricultural products under geographical indication: An alternative tool for agricultural development in Indonesia	2017	71	16	91,016
32	Analysis of Aroma Components in Anxi Huang Jingui Oolong Tea Using Different Wrapping-twisting Methods via HS-SPME-GC-MS | 基于 HS-SPME-GC-MS 分析不同包揉方式安溪黄金桂乌龙茶香气成分	2024	1	14	91,014
33	Stable isotopic and elemental characteristics with chemometrics for the geographical origin authentication of Dendrobium officinale at two spatial scales	2022	20	187	90,187
34	A Transfer Learning Method for the Protection of Geographical Indication in China Using an Electronic Nose for the Identification of Xihu Longjing Tea	2021	30	172	90,172
35	Impact of meteorological and processing factors on metabolite composition of Darjeeling tea	2024	0	36	90,036
36	Analysis of the Differences in Physical and Chemical Indicators of Tea Product Quality Standards in China | 我国茶叶产品质量标准中理化指标差异性分析	2024	0	12	90,012
37	Highlight popularity or scarcity? Research on the matching effect of regional typicality of geographical indication agricultural products and advertising appeal mode | 突出流行性还是稀缺性? 地理标志农产品地区典型性与广告诉求 方式的匹配效应研究	2024	0	10	90,01
38	Cost-effective colorimetric sensor for authentication of protected designation of origin (PDO) Longjing green tea	2023	7	348	87,348
39	Class-modelling of overlapping classes. A two-step authentication approach	2022	15	245	85,245

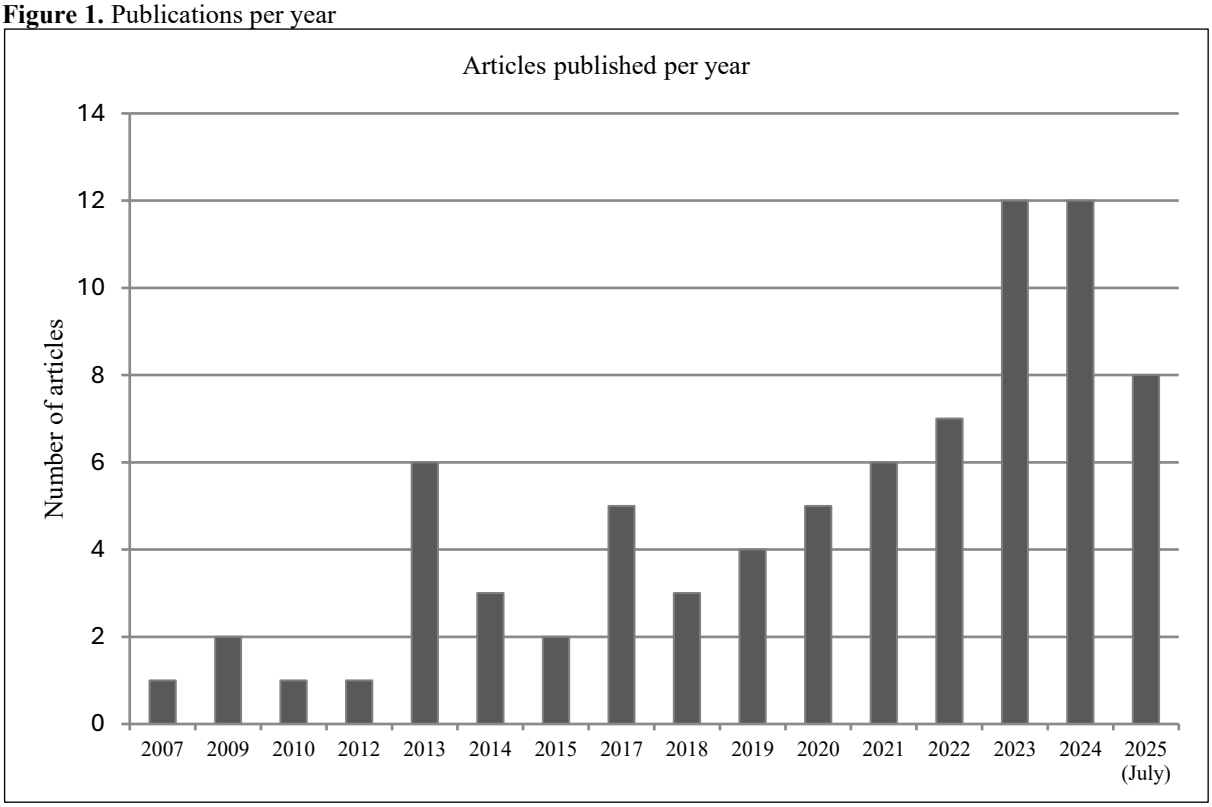
40	Comprehensive investigation on flavonoids metabolites of Longjing tea in different cultivars, geographical origins, and storage time	2023	5	115	85,115
41	Identification of Characteristic Flavor Substances of Jingyang Fu Brick Tea by Gas Chromatography-Ion Mobility Spectrometry and Headspace Solid Phase Microextraction-Gas Chromatography-Mass Spectrometry | 基于GC-IMS和HS-SPME-GC-MS分析泾阳茯砖茶的特征风味物质	2023	5	18	85,018
42	Combining class-modelling and discriminant methods for improvement of products authentication	2022	14	150	84,15
43	Authentication of honeybush and rooibos herbal teas based on their elemental composition	2021	21	174	81,174
44	Research on the spatial distribution and agglomeration characteristics of geographical indication products in China | 中国地理标志产品的空间分布与集聚特征研究	2023	1	13	81,013
45	Rapid and nondestructive discrimination of geographical origins of longjing tea using hyperspectral imaging at two spectral ranges coupled with machine learning methods	2020	30	162	80,162
46	Origin Characteristics and Traceability Discrimination of Jiangxi Tea based on Rare Earth Element Contents | 基于稀土元素含量江西茶叶产地特征分析与溯源判别	2023	0	14	80,014
47	Packaging design of Tanyang congou black tea based on geographical indication product protection | 基于地理标志产品保护的坦洋工夫红茶包装设计	2023	0	10	80,01
48	Geographical indication labelling of food and behavioural intentions	2021	14	111	74,111
49	Deep Learning Model for Soil Environment Quality Classification of Pu-erh Tea	2022	4	84	74,084
50	Exploring the potential of paper-based analytical sensors for tea geographical origin authentication	2022	2	120	72,12
51	Geographical indications and quality promotion of agricultural products in Vietnam: an analysis of government roles	2020	19	57	69,057
52	Performance Analysis of Tea Farmers' Green Production Under Multi-agent Collaborative Governance | 多主体协同治理下茶农绿色生产绩效	2021	2	16	62,016
53	Protecting the geographical indication for Darjeeling tea: Challenges and results	2019	21	7	61,007
54	Geographical indications in horticulture: An Indian perspective	2018	30	16	60,016
55	Geographical indications in development contexts: Function, supply chain and pursuit of rural industrial development	2020	9	15	59,015
56	Investigation of the microbial diversity and community structure in Shaanxi Fu brick tea | 陕西茯砖茶的微生物多样性和群落结构	2020	7	13	57,013
57	Japanese sake and tea as place-based products: a comparison of regional certifications of globally important agricultural heritage systems, geopark, biosphere reserves, and geographical indication at product level certification	2017	34	38	54,038
58	The impact of geographical indication on the revitalisation of a regional economy: A case study of 'Boseong' green tea	2007	133	101	53,101
59	changing institutions to protect regional Heritage: A case for geographical indications in the indian agrifood sector	2010	97	75	47,075
60	What Is Brewing with Kangra Tea!!	2019	7	22	47,022
61	Influence of government regulation and community governance on tea farmers'behavior of reducing pesticide use | 政府规制与社区治理对茶农减量施药行为的影响	2019	5	28	45,028
62	Research on factors influencing consumers' loyalty towards geographical indication products based on grey incidence analysis	2017	19	32	39,032
63	GIs for Protecting Agrobiodiversity and Promoting Rural Livelihoods: Status, Strategies and Way Forward	2018	6	11	36,011
64	Intellectual property and agricultural trade: Producer perceptions of tea and coffee as potential geographical indications	2018	4	29	34,029
65	Validation of origins of tea samples using partial least squares analysis and Euclidean distance method with near-infrared spectroscopy data	2012	58	169	28,169
66	Uprooting "Indigeneity" in South Africa's Western Cape: The plant that moves	2014	30	105	20,105
67	An old issue of protecting GIs for culture: A new insight from the experience of India and Bangladesh	2017	0	10	20,01
68	The plights of African resources patenting through the lenses of the world trade organisation: An assessment of South Africa's rooibos tea's labyrith journey	2014	29	61	19,061
69	Identification of fake green tea by sensory assessment and electronic tongue	2015	19	55	19,055
70	Robust and automated internal quality grading of a Chinese green tea (Longjing) by near-infrared spectroscopy and chemometrics	2013	31	35	11,035
71	The protection of indigenous terms and expressions by the Merchandise Marks act in South Africa	2015	5	10	5,01
72	Protected geographical indication identification of a Chinese green tea (Anji-White) by near-infrared spectroscopy and chemometric class modeling techniques	2013	23	35	3,035
73	Germplasm appraisal of western Himalayan tea: A breeding strategy for yield and quality improvement	2013	16	82	-3,918
74	Combining electronic tongue array and chemometrics for discriminating the specific geographical origins of green tea	2013	16	43	-3,957
75	Mechanism of protection of geographical indications: Implications for genetic resources	2013	3	24	-16,976
76	Protection of geographical indications (GIs) in India	2013	2	17	-17,983
77	Short communication: Identification of geographical indication tea with Fisher's discriminant classification and principal components analysis	2009	20	66	-39,934
78	Identification of Xihu longjing tea by PLS model using near-infrared spectroscopy	2009	7	38	-52,962

Source: elaborated by the authors (2025)

It is worth noting that the results offer more than a ranked list – they provide a snapshot of how the academic conversation around geographical indications and tea has evolved over time. The earliest article in the ranked set (no. 59), for instance, dates to 2007, and examine how Boseong green tea contributed to the revitalization of South Korea's regional economy. The authors highlight that "in the space of only six years, production has doubled, tourist numbers have tripled and prices have increased by more than 90 per cent" (Suh & MacPherson, 2007, p. 525).

The temporal distribution of the 78 articles (Figure 1) reveals a significant acceleration starting in 2013, with a notable concentration between 2020 and 2024, accounting for approximately 54% of the publications. The peak occurs in 2023 and 2024, with 12 articles published each year, reflecting the maturation of the field in connection with global agendas such as traceability, cultural identity, and ethical consumption.

Figure 1. Publications per year



Source: elaborated by the authors (2025)

This maturation is evidenced by studies such as Li et al. (2024), which address food fraud and origin authentication of black teas through spectroscopy; Zhang et al. (2024), who explore the volatile compounds of Longjing tea associated with regional sensory and symbolic value; and Gan et al. (2025), who investigated the environmental impact of geographical indications, and found that GI certification led to a reduction in methane emissions – an effect particularly significant in the case of tea and fruit products, where improved agricultural practices and reduced fertilizer use contributed to greater environmental benefits.

In short, these works illustrate how recent literature has increasingly integrated concerns with authenticity, territorial identity, and more conscious consumption practices. The recent growth coincides with advances in technologies for geographical origin authentication, such as near-infrared spectroscopy (Firmani et al., 2019; Deng et al., 2020; Liu et al., 2021), as well as more recent methods involving LC-QToF and hyperspectral imaging (Hong & He, 2020). It also

parallels the rising international debate on origin certification systems, particularly within the context of fair trade (Amusan, 2014; Brahmi et al., 2013; Shafiulla, 2013), sustainability (Gan et al., 2025; Hoang & Nguyen, 2020; Singh et al., 2013), and the differentiation of agricultural products in highly competitive markets (Liang & Lai, 2023; Hou et al., 2024; Chen, 2021; Maina et al., 2018).

As for marketing, the study of Li et al. (2025) reveals that the perceived value of GI products can significantly influence tourists' emotional responses and their intention to visit the region of origin, highlighting the strategic role of GIs in destination marketing. Similarly, the studies of Li et al. (2020), Liang and Lai (2023), and Hou et al. (2024) demonstrate that geographical indications have been progressively consolidated as marketing and geopolitical assets. Such certifications have the potential to strengthen reputations, build symbolic value, attract conscious consumers, and mediate international trade relations, especially in contexts where territorial differentiation represents a strategic competitive advantage.

4.1. Scientific Quality Assessment Using InOrdinatio

The adoption of the InOrdinatio index as a scientific qualification tool represented a significant methodological advancement in this systematic review. Proposed by Pagani et al. (2015), the index simultaneously considers three variables: journal impact factor (via JCR or SJR), number of citations, and year of publication, allowing for the classification of articles based on their updated scientific relevance. This approach helps mitigate chronological bias, such as the overvaluation of older, highly cited articles and supports the identification of studies most strategic to the current research agenda.

The analysis revealed that the three highest-ranked articles according to the InOrdinatio index represent different disciplinary fields and methodological approaches:

- **Firmani et al. (2019)** ranks first. The study, within the field of Analytical Chemistry and Food Science, applies near-infrared (NIR) spectroscopy and chemometric methods to authenticate Darjeeling tea samples. Its relevance stems from the combination of statistical rigor and practical applicability, establishing one of the key approaches for scientifically verifying the geographical origin of GI-certified products.

- In second place is **Liang and Lai (2023)**, with a study positioned in the field of Tourism and Marketing. The authors propose a conceptual model for brand image associated with geographical certification, investigating how GIs influence value perception and tourism intentions. This rare approach explores the symbolic dimensions of GIs through constructs from branding and place marketing.

- Third is **Deng et al. (2020)**, also within the field of Analytical Chemistry and Food Science. The article proposes a geochemical methodology for authenticating the origin of Chinese green teas, using spectrometric analyses and geological proxies. This contribution enhances the scientific objectivity in origin certification and reinforces the instrumental role of GIs as elements of commercial trust.

Although originating from different fields, these three studies converge in providing an expanded understanding of GIs as technical-symbolic value-adding systems, in which science, perception, and regulation are intertwined.

Based on this analysis, it is possible to identify three central thematic axes in the literature:

1. **Technical-chemical authenticity**: focused on the scientific validation of geographical origin through laboratory techniques such as spectroscopy, spectrometry, geochemistry, chemical fingerprinting, and statistical modeling (e.g. Firmani et al., 2019; Deng et al., 2020; Liu et al., 2021; Tan et al., 2022; Ren et al., 2024; Zhang et al., 2024; Gong et al., 2025);

2. **Symbolic identity and perceived value**: dedicated to the construction of GIs as brand attributes and territorial assets, with emphasis on branding, tourism, and consumer behavior (e.g., Chen, 2021; Dou et al., 2022; Liang & Lai, 2023; Qiu, 2023; Li et al., 2025);

3. **Legal regulation, governance and institutionalization**: concerning public policies, national legislation, and international agreements related to origin protection (e.g. Biénabe & Marie-Vivien, 2017; Hoang & Nguyen, 2018; Yu et al., 2019; Yu and Li, 2021; Meyer & Naicker, 2023; Fatima & Voutyrakos, 2025; Gan et al., 2025; Ghosh et al., 2025).

4. **Territorial development and socioeconomic impact**: exploring how GIs contribute to local and regional development, including rural revitalization, value chain integration, and producer empowerment (e.g. Suh & MacPherson, 2007; Rahmah, 2017; Jamal et al., 2024;).

The application of the InOrdinatio index enabled not only the classification of articles based on objective criteria of scientific quality, combining impact, recency, and dissemination, but also supported the identification of structural patterns in the contemporary literature on Geographical Indications (GIs) for teas and infusion beverages.

The analysis of the highest-ranking articles according to *the* InOrdinatio index reveals a predominance of studies rooted in the exact and applied sciences, particularly in the fields of Analytical Chemistry and Food Science. These works are primarily focused on the geographical origin authentication of teas using instrumental techniques such as near-infrared (NIR) spectroscopy, chemical fingerprinting, and geochemical modeling (Firmani et al., 2019; Deng et al., 2020; Liu et al., 2021; Zhang et al., 2024). The significant concentration of these approaches in high-impact journals, such as *Food Control* and *Food Chemistry*, underscores the centrality of the technical-scientific axis in the literature reviewed.

In contrast, studies focused on brand perception, consumer behavior, and marketing strategies remain underrepresented in the sample. Only twelve articles were classified within the fields of Tourism and Marketing, such as those by Besky (2014), Liang and Lai (2023), and Li et al. (2025). Although numerically less prominent, these works exhibit sophisticated theoretical frameworks and consistent analytical methodologies. This finding points to the emergence of a promising, yet still consolidating, line of research aimed at understanding the symbolic and market-related effects of Geographical Indications (GIs) applied to the tea sector.

The gap observed between studies focused on technical-analytical authentication and those exploring market dynamics suggests a mismatch in the disciplinary maturity of these subfields. Although both research axes address the same overarching theme, the geographical origin as a value-added differentiator, the dialogue between them remains incipient. This scenario

highlights a relevant opportunity: the development of interdisciplinary approaches that integrate laboratory-based traceability methods with investigations into consumer perception, place branding, and differentiation strategies within the global tea market.

4.2. Editorial Dispersion and Multidisciplinarity

The systematic review identified 78 articles distributed across 65 different journals, revealing a high degree of editorial dispersion and the multidisciplinary, still-consolidating nature of the field of Geographical Indications (GIs) applied to teas and infusion beverages.

The journals with the highest number of publications include *Food Control* (five articles), which focuses on food safety and authenticity; *Journal of Intellectual Property Rights* (five articles), specializing in legal discussions on intellectual property; and *Food Chemistry* (three articles) *LWT - Food Science and Technology* (three articles), centered on molecular composition and food characterization.

Other journals with at least two publications include *Foods*, *British Food Journal*, *Science and Technology of Food Industry*, *Journal of Spectroscopy*, and *Genetic Resources and Crop Evolution*. The presence of journals from fields as diverse as spectroscopy, plant genetics, and rural economics demonstrates the wide range of editorial niches that accommodate research on this topic.

The category of Analytical Chemistry and Food Science encompasses the majority of the reviewed works, primarily focusing on geographical origin authentication through laboratory-based methods such as Near Infrared (NIR) spectroscopy, chemical fingerprinting, chromatography, and sensors. These methodologies are employed to validate the provenance of GI-certified teas. Notable examples include Gong et al. (2025), who combined Gas Chromatography Ion Mobility Spectrometry (GC-IMS) and electronic nose (E-Nose) to investigate the aroma components of Liupao tea and other dark teas; Firmani et al. (2019), who applied NIR spectroscopy combined with chemometrics to differentiate authentic Darjeeling tea from adulterated samples; Deng et al. (2020), who develop a predictive model to authenticate Chinese green teas; and Liu et al. (2021), who propose techniques to trace and distinguish Guizhou green tea from teas of other regions.

The ESG area includes studies on legislation, public policies, international trade, and the social implications of GIs, with special attention to supply chains and the governance of protected territories. Besky (2014) presents a critical ethnography on the reinterpretation of the French concept of *terroir* in the Indian context, pointing out tensions between authenticity and persistent labor inequalities on tea plantations in Darjeeling. Biénabe and Marie-Vivien (2017) propose a multi-level analytical framework to assess the impacts of GIs in the Global South, highlighting institutional and territorial dynamics. Gan et al. (2025) quantify methane emission reductions in GI-certified regions using remote sensing data, while Meyer et al. (2023) examine the collective appropriation of traditional knowledge in rooibos tea production, linking GIs to power asymmetries and social exclusion.

The field of Tourism, Consumption, and Territorial Marketing emphasizes the symbolic dimension of GIs, such as their influence on brand perception, territorial valorization, and consumer experience. As previously mentioned, Li et al. (2025) affirm that the perceived value of GI products can influence tourists' intention to visit the region of its origin. Liang and Lai (2023) show how GI certification strengthens the brand image and tourist appeal of Taiwanese

teas, while Li et al. (2020) highlight the role of emotional connections to place in purchase intentions.

Articles in the Data Science category apply machine learning algorithms, multivariate analyses, and other computational techniques to classify teas by origin or to predict market patterns based on chemical properties. Li et al. (2024) propose a blockchain-based system to ensure traceability and transparency in GI tea supply chains. Yu and Gu (2021), working with Maofeng and Maojian tea from China, proposes a framework to analyze the subtle differences between them in different categories using electronic nose data. Dou et al. (2022) use predictive models and neural networks to estimate the market price of Pu'er tea, also from China, considering both macro and microeconomic variables.

Pharmacology appears less frequently in the sample, with studies exploring the bioactive compounds of teas and their potential therapeutic applications, particularly in the case of Chinse Liupao tea. According to Yang et al. (2024, p. 2), who investigate its effects on the prevention of non-alcoholic fatty liver disease (NAFLD), Liupao tea "holds historical significance as one of China's 24 renowned teas during the Qing Dynasty". Zhou et al. (2024) evaluate the effectiveness of Liupao infusion in managing hyperlipidemia, and Pan et al. (2023) demonstrated the drinking value of the tea in a modern aging society, considering it has the effect of delaying aging-related degenerative changes in the body.

In essence, the diversity of methodological and editorial approaches confirms that research on Geographical Indications in teas and infusion beverages constitutes a transversal scientific field, operating at the intersection of basic and applied sciences. While basic sciences contribute through chemical and pharmacological studies – often focused on bioactive compounds and potential health benefits – applied sciences offer insights into certification systems, consumer behavior, and regional development. Each domain brings its own analytical, epistemological, and normative tools, expanding the ways we can understand and engage with the certification, consumption, and territorial valorization of these products.

4.3. Authorship Patterns and National Origin of the Research

The geographic distribution of scientific production on teas with Geographical Indication (GI) reveals a strong concentration in Asia, particularly in China and India. This prominence can be attributed to the countries' millennia-old cultural tradition of tea, the large number of registered GIs – such as Anhua Fu, Anji White, Darjeeling, Liupao, Longjing – and the strong presence of public policies focused on territorial valorization of agri-food products.

Studies from China and India reveal distinct yet complementary research trajectories in the field of geographical indications for tea. Chinese research spans from laboratory and technological approaches – such as near-infrared spectroscopy (Deng et al., 2020; Yang et al., 2020; He et al., 2012; Xu et al., 2012) and chemometrics (Fu et al., 2013; Xu et al., 2013) – to investigations centered on brand building, experiential tourism, and symbolic identity (Liang & Lai, 2023; Li et al., 2025; Qiu et al., 2023). Meanwhile, Indian studies, particularly those focused on Darjeeling tea (India's first Geographical Indication), combine chemical analysis and traceability methods with broader discussions on labor (Besky, 2014), revitalization of local economy (Jamal et al., 2024), and the construction of value and trademark protection in competitive markets (Fatima & Voutyrakos, 2025; Ghosh et al., 2025).

Other sporadic contributions come from countries outside the China–India axis. South Africa stands out with seven relevant publications, including three studies by Małyjurek et al. (2021, 2022a, 2022b), which apply advanced techniques of chemometrics and spectroscopy to authenticate and classify samples of rooibos and honeybush – teas endemic to the region. Additionally, Amusan (2014) critically analyzes mechanisms of biopiracy and international disputes over the misappropriation of African knowledge and natural resources, highlighting the legal vulnerabilities faced by Global South countries in the patent and GI systems. Ives (2014) and Nwauche (2015), in turn, deepen institutional and anthropological discussions, addressing the challenges of recognizing indigenous expressions and the political uses of indigeneity in the context of South Africa's tea industry. Meyer and Naicker (2023) analyze how collective intellectual property can protect traditional knowledge, focusing on South African rooibos.

In Taiwan, the studies by Chen (2021) and Wong and Elbegsaikhan (2020) address consumer purchase intentions and word-of-mouth and implementation challenges of GIs in Asian contexts. In Japan, the study by Kajima et al. (2017) stands out for its comparative analysis of Geographical Indications granted to sake and green tea. The research investigates how traditional Japanese products are valued as territorial assets, exploring the legal and cultural challenges of recognizing and protecting these GIs in the domestic context.

A particular case in the database is that of Li et al. (2024), whose study applies spectroscopy and chemometrics to authenticate black teas from seven countries: Kenya, Ethiopia, Burundi, Malawi, India, Sri Lanka, and China. This multicentric approach, while valuable for transnational comparisons, makes it difficult to attribute the study to a single country, revealing the limitations of metadata standardization in multinational research.

Individual studies also offer perspectives on other countries. Hoang and Nguyen (2020) explore the role of GIs in Vietnam as tools for promoting the quality and value of traditional products, highlighting how these certifications can boost territorial development, especially in rural areas, whereas the study by Maina et al. (2020) focuses on tea and coffee value chains in Kenya, analyzing the impact of intellectual property on agricultural exports.

4.4. Gap in Marketing Studies

One of the central findings of the systematic review concerns the scarcity of studies that directly address the marketing dimensions of Geographical Indications (GIs) for teas and infusion beverages. This aspect is especially relevant given its direct alignment with the research question of this study, which seeks to understand what is known about the market value associated with GIs. Among the 78 articles analyzed, only 11 were identified as explicitly focusing on themes such as consumer behavior, territorial branding, experiential tourism, and the construction of symbolic value. All of them were classified under the knowledge area of "Tourism, Consumption, and Marketing" (Besky, 2014; Zhan et al., 2017; Maina et al., 2018; Li et al., 2020; Chen, 2021; Liang & Lai, 2023; Qiu, 2023; Hou et al., 2024; Jamal et al., 2024; Li et al., 2025).

Despite being numerically underrepresented, these studies form an emerging nucleus of critical and conceptually sophisticated reflection, as evidenced by their InOrdinatio scores. Liang and Lai (2023), with the second-highest InOrdinatio score in the entire database, analyze how GI-certified teas function as markers of brand and territorial reputation in experiential tourism

contexts in China. The study applies concepts such as branding, destination image, and perceived quality certification, combining theory and method with clarity.

Studies in Tourism and Marketing highlight the symbolic role of Geographical Indications (GIs) in building brand value, emotional connection, and territorial reputation. Liang and Lai (2023) and Li et al. (2023) show that emotional familiarity with the place of origin strengthens consumer trust and purchase intention, while Li et al. (2025) and Jamal et al. (2024) emphasize how GIs can drive regional tourism through origin-based narratives. Besky (2014) and Hou et al. (2024) explore the tensions between authenticity, inequality, and rural tourism, pointing to ethical-political challenges and economic opportunities.

Zhan et al. (2017) analyze how perceptions of authenticity and quality affect consumer loyalty, while Qiu et al. (2023) and Chen et al. (2021) stress the importance of packaging design and cultural communication in reinforcing the value of GIs. Maina et al. (2018) highlight producer awareness of territorial attributes as a key factor for economic viability in African contexts.

Although they offer important conceptual contributions, these studies share common methodological limitations. Most rely on perceptual analyses but lack robust quantitative indicators such as price elasticity, sales variation before and after GI recognition, or experiments that isolate the impact of the origin label. None of the articles apply neuromarketing techniques, longitudinal econometric modeling, or experimental analysis of consumer behavior, which represents a clear opportunity for empirical advancement.

Moreover, there is little articulation among these studies, with no cross-citations or theoretical accumulation. This disconnect may be explained by the editorial dispersion—each of the five articles is published in a different journal—and by the absence of a structured research field dedicated to GI marketing, as previously discussed.

Thus, the field lacks not only further quantitative and experimental investigations but also theoretical syntheses that systematize key concepts—such as perceived authenticity, symbolic value, and territorial storytelling—and integrate results into predictive models on the marketing effectiveness of GIs.

5. Conclusion

Based on the analysis of 78 articles classified according to the InOrdinatio index, the findings reveal that the marketing dimension of Geographical Indications (GIs) for teas remains incipient in the international literature, mostly addressed tangentially through technical studies or those focused on ESG practices and regulation. The majority of the articles are concentrated in the fields of Analytical Chemistry and Food Science, with 30 studies prioritizing origin authentication, such as those by Deng et al. (2020), Liu et al. (2021), and Zhang et al. (2024).

Only twelve articles directly addressed themes related to marketing, such as market dynamics, brand perception, symbolic value, place branding, or experiential tourism, including the works of Liang and Lai (2023), Li et al. (2025), Besky (2014), Hou et al. (2024), among others. Although conceptually robust, these studies remain disconnected, with predominantly qualitative approaches and a lack of consistent commercial metrics such as price elasticity, sales impact, or consumer engagement measurement. No studies involving experimental designs, purchasing behavior models, or investigations in digital environments were identified.

Thus, the answer to this study's central question is twofold: while current research offers only limited insight into the marketing dimension of teas with geographical indications, it provides a clear starting point for future investigations. More specifically, the existing literature highlights the symbolic and communicative potential of GIs in teas and infusions as a market differentiation strategy, but there remains a significant gap between the theoretical recognition of this potential and its empirical measurement.

Another relevant finding from the review is the near-complete absence of empirical studies focused on Latin American countries, particularly Brazil. The analyzed database, composed of internationally indexed articles, contains no study that references Brazil, despite the country having four officially recognized GIs for teas and infusions: IG Mathe, Camomila de Mandirituba, Planalto Norte Catarinense, and Região de Machadinho.

This absence suggests a disconnect between institutional practice and academic engagement with GIs in Brazil, particularly in the fields of marketing, consumer behavior, and strategic communication. It also underscores the geographical concentration of academic production on the topic in Asia – especially China and India – where tea is a culturally consolidated element and the object of robust public policies (Biénabe & Marie-Vivien, 2017; Piñeiro & Curzi, 2024; Hoang & Nguyen, 2020; Kajima et al., 2017).

The lack of Latin American studies also limits the construction of intercultural comparisons that could reveal how different traditions, narratives, and socio-territorial contexts shape the perception and market use of GIs.

Despite these limitations, the reviewed literature provides consistent evidence that GIs can function as strategic marketing assets, particularly in contexts where origin is a positively perceived value. Li et al. (2025), for instance, demonstrate how GIs enhance brand image, differentiate tourism destinations, and foster emotional connections with the product.

These contributions point to three promising avenues for further research:

- The application of quantitative and experimental methods (such as preference testing, neuromarketing, or discrete choice experiments) to assess the effectiveness of GIs as a perceived value attribute and purchase decision trigger;

- The exploration of digital strategies and territorial narratives, such as the use of storytelling on social media, origin videos, local influencers, and sensory marketing, which are currently absent in the reviewed literature;

- The development of integrated territorial branding models that combine elements of cultural identity, origin reputation, and community engagement with market performance indicators.

These gaps and opportunities reinforce that GIs for tea should not be seen merely as legal tools for protection but as symbolic and strategic resources for communicating value, enabling competitive differentiation, and activating territories, especially relevant in a consumer landscape increasingly driven by authenticity, origin, and purpose.

Inevitably, this research carries its own set of limitations. Perhaps the most significant lies in the exclusive use of the Scopus database for identifying and selecting scientific articles. While

Scopus offers a broad and reputable index of peer-reviewed literature, it may exclude relevant publications from emerging journals or non-English sources, particularly those from the Global South. As a result, some regionally significant or recent contributions may have been overlooked. Future studies could benefit from incorporating new, open-access databases, such as OpenAlex, which offer a wider and more inclusive scope of academic production, enhancing the diversity and representativeness of the literature on Geographical Indications.

References

Aaker, D. A. (1996). *Building strong brands*. Free Press.

Amusan, L. (2014). The Plights of African Resources Patenting through the Lenses of the World Trade Organisation: An Assessment of South Africa's Rooibos Tea's Labyrith Journey. *African Journal of Traditional Complementary and Alternative Medicines*, *11*(5), 41. https://doi.org/10.4314/ajtcam.v11i5.7

Artêncio, M. M., Giraldi, J. M. E., & Galina, S. V. R. (2019). Uma análise crítica do papel e importância socioeconômica das indicações geográficas em países em desenvolvimento. *Internext, 14*(3), 218–234. https://doi.org/10.18568/internext.v14i3.483

Barham, E. (2003). Translating terroir: The global challenge of French AOC labeling. *Journal of Rural Studies, 19*(1), 127–138. https://doi.org/10.1016/S0743-0167(02)00052-9

Besky, S. The labor of *terroir* and the *terroir* of labor: Geographical Indication and Darjeeling tea plantations. *Agric Hum Values,* 31, 83–96 (2014). https://doi.org/10.1007/s10460-013-9452-8

Biénabe, E., & Marie-Vivien, D. (2017). Institutionalizing Geographical Indications in Southern Countries: Lessons Learned from Basmati and Rooibos. *World Development*, *98*, 58–67. https://doi.org/10.1016/j.worlddev.2015.04.004

Brahmi, P., Chaudhary, V., & Tyagi, V. (2013). Mechanism of Protection of Geographical indications: Implications for genetic resources. *Vegetos*, *26*(2), 171. https://doi.org/10.5958/j.2229-4473.26.2.071

Bramley, C., Biénabe, E., & Kirsten, J. (2009). The Economics of Geographical Indications: Towards a Conceptual Framework for Geographical Indication Research in Developing Countries (Chapter 4). In *The Economics of Intellectual Property: Suggestions for Further Research in Developing Countries and Countries with Economies in Transition* (WIPO – World Intellectual Property Organization)*,* 109–141. https://tind.wipo.int/record/28242?v=pdf

Brasil. (2019). *Indicação geográfica: instrumento de valorização dos territórios e construção de mercado para produtos tradicionais*. Instituto Nacional da Propriedade Industrial (INPI). https://www.gov.br/inpi/pt-br/assuntos/indicacoes-geograficas

Campos, R. P. de, Santos, L. L. dos, Castro, V. A., & Giraldi, J. M. E. (2023). Brazilian geographical indications: A map of scientific production from 1996 to 2022. *Journal of Iberian and Latin American Research, 29*(2), 186–201. https://doi.org/10.1080/13260219.2023.2296223

Cassago, A. L. L., Artêncio, M. M., Giraldi, J. M. E., & Costa, F. B. da. (2021). Metabolomics as a marketing tool for geographical indication products: A literature review. *European Food Research and Technology, 247*(9), 2143–2159. https://doi.org/10.1007/s00217-021-03782-2

Castro, V. A., & Giraldi, J. M. E. (2018). Estratégias de marcas para setores brasileiros: Diferenças conceituais entre indicação geográfica, marca coletiva e setorial. *Espacios, 39*(33), 8. https://www.revistaespacios.com/a18v39n33/a18v39n33p08.pdf

Chen, N. (2021). Geographical indication labelling of food and behavioural intentions. *British Food Journal*, *123*(12), 4097–4115. https://doi.org/10.1108/bfj-06-2020-0552

Cerdan, C. M. T.; Bruch, K. L.; Silva, A, L.; Copetti, M.; Fávero, K. C.; Locatelli, L. (2014). Indicação geográfica de produtos agropecuários: importância histórica e atual. In: Pimentel, L. O. (Org.), *Curso de propriedade intelectual e inovação no agronegócio (4th Ed.): Módulo II – Indicação Geográfica*. Ministério da Agricultura, Pecuária e Abastecimento. ISBN: 978-85-7426-136-2.

Covalchuck, G. C., & Medeiros, M. de L. (2023). Geographical indication of São Matheus as a boost to gastronomic tourism. *Tourism and Heritage Journal, 5*, 37–55. https://doi.org/10.1344/THJ.2023.5.3

Deng, X., Liu, Z., Zhan, Y., Ni, K., Zhang, Y., Ma, W., Shao, S., Lv, X., Yuan, Y., & Rogers, K.M. (2020). Predictive geographical authentication of green tea with protected designation of origin using a random forest model. *Food Control*, *107* , 106807. https://doi.org/10.1016/j.foodcont.2019.106807

Dinnie, K. (2016). *Nation branding: Concepts, issues, practice* (2nd ed.). Routledge.

Dou, Z., Ji, M., Wang, M., & Shao, Y. (2022). Price Prediction of Pu'er tea based on ARIMA and BP Models. *Neural Computing and Applications*, *34*(5), 3495–3511. https://doi.org/10.1007/s00521-021-05827-9

Fatima, A., & Voutyrakos, N. (2025). Two sides of the same coin: the Darjeeling tea saga and the need to reform the legal protection of geographical indications. *International Journal of Intellectual Property Management*, *15*(3), 292–309. https://doi.org/10.1504/ijipm.2025.146209

Firmani, P., De Luca, S., Bucci, R., Marini, F., & Biancolillo, A. (2019). Near infrared (NIR) spectroscopy-based classification for the authentication of Darjeeling black tea. *Food Control*, *100*, 292–299. https://doi.org/10.1016/j.foodcont.2019.02.006

Fu, J., Liu, R., Chen, Y., & Xing, J. (2022). Discrimination of geographical indication of Chinese green teas using an electronic nose combined with quantum neural networks: A portable strategy. *Sensors and Actuators B Chemical*, *375*, 132946. https://doi.org/10.1016/j.snb.2022.132946

Gan, W., Yang, F., Fan, D., & Dai, X. (2025). Beyond consumer willingness to pay: impact of geographical indications on greenhouse gas emissions. *Applied Economics Letters*, 1–4. https://doi.org/10.1080/13504851.2024.2448235

Gezer, I., De Moura Engracia Giraldi, J., Galina, S. V. R., De Paião Campos, R., & Maheshwari, V. (2024). Geographical Indications as a Strategy for international market orientation: A bibliometric and Systematic review of the literature. In *Developments in marketing science: proceedings of the Academy of Marketing Science* (pp. 143–156). https://doi.org/10.1007/978-3-031-80904-0_14

Ghosh, J., Baneri, O., Samanta, N., & Bhargava, A. Geographical Indication (GI) laws in India and its implementation: A critical appraisal. (2025). *Journal of Intellectual Property Rights*, *30*(3), 304–313. https://doi.org/10.56042/jipr.v30i3.9953

Giovannucci, D., Barham, E., & Pirog, R. (2009). Defining and marketing "local" foods: Geographical indications for US products. *The Journal of World Intellectual Property, 13*(2), 94–120. https://doi.org/10.1111/j.1747-1796.2009.00370.x

Gong, S., Zhang, Z., Chen, J., Wu, H., Jiang, H., Teng, C., & Dai, Z. (2025). Enhanced Understanding of Dark Tea Quality through Integrated GC-IMS and E-Nose Analysis. *LWT*, 117806. https://doi.org/10.1016/j.lwt.2025.117806

Hoang, G., & Nguyen, T. T. (2020). Geographical indications and quality promotion of agricultural products in Vietnam: an analysis of government roles. *Development in Practice*, *30*(4), 513–522. https://doi.org/10.1080/09614524.2020.1729344

Hong, Z., & He, Y. (2020). Rapid and Nondestructive Discrimination of Geographical Origins of Longjing Tea using Hyperspectral Imaging at Two Spectral Ranges Coupled with Machine Learning Methods. *Applied Sciences*, *10*(3), 1173. https://doi.org/10.3390/app10031173

Hou, Z., Jin, Y., Gu, Z., Zhang, R., Su, Z., & Liu, S. (2024). 1H NMR Spectroscopy Combined with Machine-Learning Algorithm for Origin Recognition of Chinese Famous Green Tea Longjing Tea. *Foods*, *13*(17), 2702. https://doi.org/10.3390/foods13172702

Ives, S. (2014). *Postcolonial cultural politics of geographical indications in South Africa: Rooibos and Honeybush*. Journal of Agrarian Change, 14(3), 335–356. https://doi.org/10.1111/joac.12034

Jamal, S., Upadhyay, Y., & Moin, M. F. (2024). Impact of Geographical Indications on Revitalisation of Local Economy: A Case Study of Darjeeling Tea. *Journal of Intellectual Property Rights, 29*(1), 443–456. https://doi.org/10.56042/jipr.v29i5.4456

Kajima, S., Tanaka, Y., & Uchiyama, Y. (2017). Japanese sake and tea as place-based products: a comparison of regional certifications of globally important agricultural heritage systems, geopark, biosphere reserves, and geographical indication at product level certification. *Journal of Ethnic Foods*, *4*(2), 80–87. https://doi.org/10.1016/j.jef.2017.05.006

Kim, S., Lee, J. H., & Choi, Y. (2023). *Chemical profiling of Korean green teas for geographical origin identification*. Food Chemistry, 411, 135497. https://doi.org/10.1016/j.foodchem.2023.135497

Li, Q., Li, X., Chen, W., Su, X., & Yu, R. (2020). Involvement, place attachment, and environmentally responsible behaviour connected with geographical indication products. *Tourism Geographies*, *25*(1), 44–71. https://doi.org/10.1080/14616688.2020.1826569

Li, X., Li, X., Kuang, T., Cheng, L. and Wu, Q. (2025), "From GI products consumers to destination visitors: an examination of the push side mechanism", *Asia Pacific Journal of Marketing and Logistics*, Vol. 37 No. 5, pp. 1228-1254. https://doi.org/10.1108/APJML-05-2024-0621

Li, Y., Logan, N., Quinn, B., Hong, Y., Birse, N., Zhu, H., Haughey, S., Elliott, C. T., & Wu, D. (2024). Fingerprinting black tea: When spectroscopy meets machine learning a novel workflow for geographical origin identification. *Food Chemistry*, *438*, 138029. https://doi.org/10.1016/j.foodchem.2023.138029

Liang, S.-H., & Lai, I. K. W. (2023). Tea tourism: Designation of origin brand image, destination image, and visit intention. *Journal of Vacation Marketing*, *29*(3), 409-427. https://doi.org/10.1177/13567667221099952.

Maina, F. W., Mburu, J., Ackello-Ogutu, C., & Egelyng, H. (2018). Intellectual property and agricultural trade: Producer perceptions of tea and coffee as potential geographical indications. *Open Agriculture*, *3*(1), 586–595. https://doi.org/10.1515/opag-2018-0062

Maiorki, G. J., & Dallabrida, V. R. (2015). A indicação geográfica de produtos: Um estudo sobre sua contribuição econômica no desenvolvimento territorial. *Interações, 16*(1), 13–25. https://doi.org/10.1590/151870122015101

Małyjurek, Z., De Beer, D., Joubert, E., & Walczak, B. (2022b). Combining class-modelling and discriminant methods for improvement of products authentication. *Chemometrics and Intelligent Laboratory Systems*, *228*, 104620. https://doi.org/10.1016/j.chemolab.2022.104620

Małyjurek, Z., De Beer, D., Van Schoor, H., Colling, J., Joubert, E., & Walczak, B. (2022a). Class-modelling of overlapping classes. A two-step authentication approach. *Analytica Chimica Acta*, *1191*, 339284. https://doi.org/10.1016/j.aca.2021.339284

Małyjurek, Z., Zawisza, B., De Beer, D., Joubert, E., & Walczak, B. (2021). Authentication of honeybush and rooibos herbal teas based on their elemental composition. *Food Control*, *123*, 107757. https://doi.org/10.1016/j.foodcont.2020.107757

Meyer, C., & Naicker, K. (2023). Collective intellectual property of Indigenous peoples and local communities: Exploring power asymmetries in the rooibos geographical indication and industry-wide benefit-sharing agreement. *Research Policy*, *52*(9), 104851. https://doi.org/10.1016/j.respol.2023.104851

Mindrut, S., Manolica, A., & Roman, C. T. (2015). Building brands identity. *Procedia Economics and Finance, 20*, 393–403. https://doi.org/10.1016/S2212-5671(15)00088-X

Nwauche, E. (2015). The protection of indigenous terms and expressions by the Merchandise Marks Act in South Africa. *Queen Mary Journal of Intellectual Property*, *5*(2), 214–225. https://doi.org/10.4337/qmjip.2015.02.06

OpenAI. (2024). *ChatGPT* [Large language model]. https://chat.openai.com

Pagani, R. N., Kovaleski, J. L., & Resende, L. M. (2015). Methodi Ordinatio: A proposed methodology to select and rank relevant scientific papers encompassing the impact factor, number of citation and year of publication. *Scientometrics, 105*(3), 2109–2135. https://doi.org/10.1007/s11192-015-1744-x

Pan, W., Li, W., Wu, H., Xie, X., Xie, M., Nie, Q., Liu, Z., & Cai, S. (2023). Aging-Accelerated Mouse Prone 8 (SAMP8) Mice Experiment and Network Pharmacological Analysis of Aged Liupao Tea Aqueous Extract in Delaying the Decline Changes of the Body. *Antioxidants*, *12*(3), 685. https://doi.org/10.3390/antiox12030685

Penker, M., Scaramuzzi, S., Edelmann, H., Belletti, G., Marescotti, A., Casabianca, F., & Quiñones-Ruiz, X. F. (2022). Polycentric structures nurturing adaptive food quality governance: Lessons learned from geographical indications in the European Union. *Journal of Rural Studies, 89*, 208–221. https://doi.org/10.1016/j.jrurstud.2021.11.023

Piñeiro, C. V., & Curzi, D. (2024). Assessing the role of geographical indications in affecting the quality of imports. *Journal of Agricultural Economics*, *75*(2), 653–671. https://doi.org/10.1111/1477-9552.12578

Qiu, H. Z. (2023). Packaging design of Tanyang congou black tea based on geographical indication product protection. *Food and Machinery*, *39*, 108–113. https://doi.org/10.13652/j.spjx.1003.5788.2023.60018

Rahmah, M. (2017). The Protection of Agricultural Products under Geographical Indication: An Alternative Tool for Agricultural Development in Indonesia. *Journal of Intellectual Property Rights*, *22*, 90–103. http://nopr.niscpr.res.in/handle/123456789/42446

Rangnekar, D. (2004). The socio-economics of geographical indications: A review of empirical evidence from Europe. *UNCTAD–ICTSD Project on IPRs and Sustainable Development*. https://unctad.org/system/files/official-document/ictsd2004ipd8_en.pdf

Ren, W., Xu, M., Chen, W., Gu, M., Zeng, S., Jin, S., Chen, B., & Ye, N. (2024). Analysis of Aroma Components in Anxi Huang Jingui Oolong Tea Using Different Wrapping-twisting Methods via HS-SPME-GC-MS. *Science and Technology of Food Industry, 45*(24), 263−271. (in Chinese with English abstract). https://doi.org/10.13386/j.issn1002-0306.2024010279

Schotten, M., El Aisati, M., Meester, W. J. N., Steiginga, S., & Ross, C. A. (2017). A brief history of Scopus: The world's largest abstract and citation database of scientific literature. In *Research Analytics: Boosting University Productivity and Competitiveness through Scientometrics* (pp. 31-58). CRC Press. https://doi.org/10.1201/9781315155890

Shafiulla, B. (2013). Protection of Geographical Indications (GIs) in India. *Prabandhan Indian Journal of Management*, *6*(3), 5. https://doi.org/10.17010/pijom/2013/v6i3/59977

Silva, L. M. da, Dias, A., & Giraldi, J. M. E. (2024). Innovation in geographical indications: An integrative literature review and research agenda. *Journal of Food Products Marketing*, 1–19. https://doi.org/10.1080/10454446.2024.2417111

Silva, R. K. da, Barreta, L. M., Giraldi, J. M. E., & Lourenção, M. T. de A. (2022). Desenvolvimento de um modelo de identidade de marca para indicações geográficas: Uma aplicação à IG Matas de Rondônia. In *Anais do SemeAd – Seminários em Administração da Universidade de São Paulo*. https://submissao.semead.com.br/25semead/anais/arquivos/199.pdf

Singh, S., Sud, R. K., Gulati, A., Joshi, R., Yadav, A. K., & Sharma, R. K. (2013). Germplasm appraisal of western Himalayan tea: a breeding strategy for yield and quality improvement. *Genetic Resources and Crop Evolution*, *60*(4), 1501–1513. https://doi.org/10.1007/s10722-012-9938-z

Suh, J., & MacPherson, A. (2007). The impact of geographical indication on the revitalisation of a regional economy: a case study of 'Boseong' green tea. *Area*, *39*(4), 518–527. https://doi.org/10.1111/j.1475-4762.2007.00765.x

Tan, H. R., Chan, L. Y., Lee, H. H., Xu, Y., & Zhou, W. (2022). Rapid authentication of Chinese oolong teas using atmospheric solids analysis probe-mass spectrometry (ASAP-MS) combined with supervised pattern recognition models. *Food Control*, *134*, 108736. https://doi.org/10.1016/j.foodcont.2021.108736

TRIPS: Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T. S. 299, 33 I.L.M. 1197 (1994). Available at: https://www.wto.org/english/docs_e/legal_e/27-trips.pdf. Accessed in July 2025.

Xu, L., Shi, P., Fu, X., Cui, H., Ye, Z., Cai, C., & Yu, X. (2012). Protected geographical indication identification of a Chinese green tea (Anji-White) by Near-Infrared spectroscopy and chemometric class modeling techniques. *Journal of Spectroscopy*, *2013*, 1–8. https://doi.org/10.1155/2013/501924

Xu, L., Yan, S., Ye, Z., Fu, X., & Yu, X. (2013). Combining electronic tongue array and chemometrics for discriminating the specific geographical origins of green tea. *Journal of Analytical Methods in Chemistry*, *2013*, 1–5. https://doi.org/10.1155/2013/350801

Wong, C., & Elbegsaikhan, M. (2020). Geographical indications in development contexts: Function, supply chain and pursuit of rural industrial development. *The Journal of World Intellectual Property*, *23*(5–6), 712–735. https://doi.org/10.1111/jwip.12169

Yang, S., Wei, Z., Luo, J., Wang, X., Chen, G., Guan, X., She, Z., Liu, W., Tong, Y., Liu, H., Wen, M., Chen, H., Zhu, P., Li, G., Wang, D., Huang, L., Xu, S., Chen, D., Zhang, Q., & Wei, Y. (2024). Integrated bioinformatics and multiomics reveal Liupao tea extract alleviating NAFLD via regulating hepatic lipid metabolism and gut microbiota. *Phytomedicine*, *132*, 155834. https://doi.org/10.1016/j.phymed.2024.155834

Yu, D., & Gu, Y. (2021). A Machine Learning Method for the Fine-Grained Classification of Green Tea with Geographical Indication Using a MOS-Based Electronic Nose. *Foods*, *10*(4), 795. https://doi.org/10.3390/foods10040795

Yu, Y., & Li, H. (2021). Performance Analysis of Tea Farmers' Green Production Under Multi-agent Collaborative Governance. *Resources and Environment in the Yangtze Basin, 30*(9), 2299–2310. https://yangtzebasin.whlib.ac.cn/EN/10.11870/cjlyzyyhj202109023

Yu, Y., Li, H., & Xue, C. (2019). Influence of government regulation and community governance on tea farmers' behavior of reducing pesticide use. Resources Science, *41*(12), 2227–2236. https://doi.org/10.18402/resci.2019.12.07

Zhan, H., Liu, S., & Yu, J. (2017). Research on factors influencing consumers' loyalty towards geographical indication products based on grey incidence analysis. *Grey Systems Theory and Application*, *7*(3), 397–407. https://doi.org/10.1108/gs-10-2016-0037

Zhang, H., Zhang, J., Liu, S., Li, T., Wei, Y., Gu, Z., Su, Z., Ning, J., Wang, Y., & Hou, Z. (2024). Characterization of the key volatile compounds in longjing tea (Camellia sinensis) with different aroma types at different steeping temperatures by GC–MS and GC–IMS. *LWT*, *200*, 116183. https://doi.org/10.1016/j.lwt.2024.116183

Zheng, Y., Zhang, C., Ren, D., Bai, R., Li, W., Wang, J., Shan, Z., Dong, W., & Yi, L. (2023). Headspace solid-phase microextraction coupled with gas chromatography-mass spectrometry (HS-SPME-GC-MS) and odor activity value (OAV) to reveal the flavor characteristics of ripened Pu-erh tea by co-fermentation. *Frontiers in Nutrition*, *10*. https://doi.org/10.3389/fnut.2023.1138783

Zhou, H., Wang, X., She, Z., Huang, L., Wei, H., Yang, S., Wei, Z., Chen, H., Yang, B., Hu, Z., Feng, X., Zhu, P., Li, Z., Shen, J., Liu, H., Dong, H., Chen, G., & Zhang, Q. (2024). Combining bioinformatics and multiomics strategies to investigate the key microbiota and active components of Liupao tea ameliorating hyperlipidemia. *Journal of Ethnopharmacology*, *333*, 118438. https://doi.org/10.1016/j.jep.2024.118438