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Quality Control Technology and Standardization of Geographical Indications

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Abstract: As an important component of intellectual property, the geographical indications is crucial for socioeconomic development, trade investment, and the protection of cultural heritage, and is highly valued in China. Due to the geographical complexity of geographical indications, there are still a series of unresolved issues in the exploration of characteristic quality and high-level protection of geographical indication products. This article focuses on the development of characteristic quality protection technologies for geographical indication products, discusses the application of modern analytical technology in the quality mining of geographical indication products, the new prospects and challenges of omics technology in product identity confirmation, the differences in practice of geographical indication product quality assurance system, and the practical exploration of classification and grading of production areas at home and abroad. Facing opportunities and challenges, China has begun to adopt standardized concepts and methods to solve problems, promote the revision of national standards through the establishment of specialized technical committee institutions, cooperate with international organizations to promote international protection and development, focus on science and technology forums to promote high-quality industrial development, and jointly promote the internationalization and high-quality development of geographical indication products.

Keywords: geographical indications; quality control; technology; standards; international cooperation

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1 Research Background

Since the reform and opening up, the Chinese government has attached great importance to the protection of geographical indications. Chinese goverment clearly pointed out that "strengthening the protection of intellectual property rights is the most important content of improving the protection of property rights, and also the greatest incentive for improving China's economic competitiveness"[1]. Geographical indications, as an important type of intellectual property recognized by the international community and confirmed by China's Civil Code, have become a "scarce resource" for market competition, a "critical move" for promoting the development of regional characteristic economies, an "important force" for promoting diplomacy and foreign trade, and a "vivid carrier" for protecting traditional cultural heritage[2]. Protecting geographical indications is of great significance for promoting economic and social development, promoting trade and investment, and protecting cultural heritage.

Over the years, the Chinese government has been continuously strengthening its efforts in the protection of geographical indications, and has successively formulated and implemented

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the "14th Five-Year Plan for the Protection and Application of Geographical Indications"[3], "Measures for the Protection of Foreign Geographical Indication Products"[4], "Administrative Measures for the Use of Unified Official Sign for Geographical Indications (Trial Implementation)"[5], etc., and has taken various effective measures to improve the quality and market competitiveness of protected products. In terms of increasing product added value and farmers' income, safeguarding consumers' rights and interests, promoting local economic development, and protecting traditional cultural heritage, the importance of geographical indication protection is increasingly prominent.

2 Problem Statement

The core of high-level protection of geographical indications is to safeguard distinctive qualities and highlight the "original flavor". The reasons for the long-standing reputation of French champagne and Italian Parma ham are closely related to the use of comprehensive quality display, whole-process process management, and full-body quality monitoring, as well as the application of quality technology control methods such as "technical regulations–inspection and testing–quality monitoring-property protection"[6,7]. Compared with the EU mutual guarantee products, the popularity and influence of China's mutual guarantee products are obviously insufficient, especially in terms of insufficient characteristic degree of product quality, weak control degree, insufficient display degree, and low traceability credibility. It cannot effectively meet the requirements of mutual recognition protection between China and the EU[8]. Using national quality infrastructure (NQI) such as standards, metrology, inspection and testing, certification and accreditation to support product quality assurance, improvement, transmission, and trust has become a common practice of international organizations such as the World Trade Organization, the United Nations Industrial Development Organization, and developed countries such as the European Union. Prioritizing the collaborative integration of geographical indication product characteristic quality control technology with NQI elements plays a leading and key role in implementing high-level geographical indication protection.

3 Key Technologies for the Protection of the Characteristic Quality of Geographical

Looking at the development of geographical indication protection technology in China and the world else, there are four key areas that require attention in the current development of geographical indication protection technology.

3.1 Application of Modern Analytical Technology in the Quality Mining of Geographical Indication Products

Modern analytical techniques have been widely applied in quality mining, and standardized methods for quantitative evaluation of characteristic quality need to be developed. Comprehensive utilization of multiple modern analytical techniques to comprehensively analyze quality characteristics from the aspects of appearance, texture, flavor, nutrition, etc., is a recognized and effective method for characteristic quality mining. Due to the complexity of production areas, climate environments, and processing techniques, scientific characterization of the differences between the commonality within the geographical indication product group and the non-geographical indication product group has become a technical bottleneck for characteristic quality mining and characterization. The University of California, Davis (UC-Davis) and the International Organization for Standardization Food Technical Committee Sensory Technology Subcommittee (ISO/TC34/SC12) have conducted certain explorations on difference evaluation methods, such as developing threshold determination in sensory perception response and interaction, and applying linear scaling to quantify sensory characteristics. Domestic research has also been conducted in the areas of perceptual intensity quantification and evaluation method establishment. Overall, China has not yet formed a standardized evaluation technology for

characteristic quality difference quantification, and there is still a strong subjectivity in characteristic quality screening and evaluation. Establishing a standardized evaluation technology for characteristic quality based on difference degree, taking into account characteristics, sensitivity, stability, and applicability, can effectively promote the confirmation and scientific control of geographical indication product characteristic quality.

3.2 Prospects and Challenges of Omics Technology in Product Identity Confirmation

The development and application of omics technology is in the ascendant, and the comprehensive application of multi-omics fingerprint maps for product identity confirmation is the trend of the times[9]. The omics identity fingerprint characterization technology, represented by elemental, metabolomic, and genomic fingerprints, has achieved significant development at home and abroad and has been applied in various products[10]. Elemental composition and stable isotopic carbon ratio fingerprints can accurately reflect the soil information and climate characteristics of product origin, but the formation mechanism and spatiotemporal variation law of elemental composition characteristics need to be further studied. Genomic fingerprinting technology is recommended by the International Union for the Protection of New Varieties of Plants for the identification of varieties and individuals, and method standards have been developed for products such as rice and corn. However, at present, most geographical indication products in China still lack DNA fingerprinting variety identification methods. Metabolomic fingerprint maps include information such as geographical, technological, and variety characteristics, but there are still significant deficiencies in database completeness and accuracy. No single omics tool can perfectly solve the problem of product identity confirmation, and it is still necessary to innovate data integration algorithms, improve classification modeling techniques, and enhance the reliability and accuracy of model recognition.

3.3 Establishing a Quality Assurance System for Geographical Indications

Establishing a distinctive quality assurance system is a common practice abroad[11]. Quality control and verification technology still have much room for improvement. Quality control and verification are key links to achieve a quality assurance system for geographical indication products. France's Contet cheese has established a quality control procedure and control points for the entire chain from dairy farming, fresh milk collection, sterilization and fermentation, cheese ripening, packaging and warehousing, inspection and testing, achieving full-chain control. Indonesia's Jintaman Coffee has established a multi-party collaborative quality control and verification system including producer self-inspection, local association verification, and government organization supervision, effectively ensuring the regional characteristics of the product and achieving super brand effect and high premium. China proposed the establishment of a quality assurance system for geographical indication products in 2005, but so far there is not much research on distinctive quality control and verification points, procedures, methods, etc., based on the association of production areas, which cannot effectively guide the strict protection of the distinctive quality of geographical indication products. Compared with France and other EU countries, there is still much room for improvement.

3.4 Exploration of the Practice of Classification and Grading of Geographical Indication Origins

The classification and grading of production areas has been explored in individual products, but a systematic and scientific classification and grading model and method have not yet been formed. EU countries have earlier explored the classification and grading system of product production areas. For example, the Bordeaux Wine Association of France divides the Bordeaux wine production area into three major production areas: the Left Bank of Bordeaux, the Between Two Seas, and the Right Bank of Bordeaux[12]. The Left Bank production area is divided into smaller production areas such as Médoc, Pauillac, Margaux, etc.,

and the classification of the classified famous chateaus is carried out within the smaller production areas. The classification and grading system shows consumers the different styles and diverse qualities of Bordeaux wine. Some products in China have begun to explore the classification of production areas, but due to the lack of research on production area classification technology and unclear classification basis, there is confusion in classification. Taking Pu'er tea as an example, some are divided into three major production areas: Xishuangbanna, Pu'er, and Lincang, while some add Baoshan as a fourth major production area, and some add Yiwu and Menghai as six major production areas, which do not fully cover the 11 states determined by local governments. At present, there is a severe lack of research on the background, factors, methods, etc. of the classification and grading of geographical indication products at home and abroad, and there is no theoretical model or systematic method for reference.

4 Geographical Indication Protection and Standardization Practice

Facing opportunities and challenges, China has begun to apply standardized concepts and methods to seek solutions. The China National Institute of Standardization (CNIS), affiliated to the State Administration for Market Regulation, is a social welfare research institution that conducts basic, general, and comprehensive standardization research and services. The China National Institute of Standardization (CNIS) Agricultural Food Standardization Research Institute has been engaged in the research of geographical indication protection for more than 15 years. Relying on national science and technology support projects, quality inspection public welfare industry research projects, and former quality inspection administration science and technology plans, it has led the research work on potential geographical indication resource evaluation, geographical indication product characteristic quality protection, and geographical indication origin identification technology methods. The project results have produced significant social and economic benefits. The following practices have been carried out in the standardization of geographical indication protection.

4.1 Establishing a Special Agency to Promote the Revision of National Standards for Geographical Indications

On December 2, 2020, the National Standards Commission has re-established the National Technical Committee on Intellectual Property and Knowledge Management of Standardization Administration of China, mainly responsible for the formulation and revision of national standards in the field of geographical indication product protection. The Secretariat is led by China National Institute of Standardization, and the China National Intellectual Property Administration is responsible for daily management and business guidance.

As of October 2023, 147 national standards for the protection of geographical indications have been formulated and published, including 1 basic general standard and 146 product standards; 11 national standards have been newly established, including 2 basic general standards. The Identification of Geographical Indication—Classification and Codes of Products (GB/T 43583—2023) has been released and implemented, and the Geographical Indications—Basic Terms is about to undergo technical review. There are 9 product standards, including "Quality Requirements for Geographical Indication Products—Wuliangye Liquor", which are under development. The foreign language version of the standards will be formulated simultaneously in the future.

The plan for the revision of 9 product standards, including the "Quality Requirements for Geographical Indication Products—Baoshan Xiaoli Coffee", is currently being publicly solicited for comments nationwide. The Geographical Indication Sub Technical Committee of the National Knowledge Management Standardization Technical Committee has been publicly soliciting suggestions for the revision of national geographical indication standards from the society year by year, with priority given to geographical indication products that have been included in the "Agreement on the Protection and Cooperation of Geographical

Indications between China and the European Union". According to the situation of soliciting standard projects, the necessity and feasibility of project approval will be discussed and voted on. The urgent needs will be prioritized, and the implementation will be carried out step by step. The dynamic adjustment will be made, and the project plan application will be reported to the National Standards Committee in a timely manner.

4.2 International Cooperation

The China National Institute of Standardization is responsible for the work of the Chinese Secretariat of the International Organization for Geographical Indication Network (oriGIn). oriGIn is the first international organization for the protection of geographical indications producers, established in Geneva, Switzerland, in July 2003. Its members include more than 350 geographical indication management institutions and associations from more than 40 countries, representing nearly 10 million geographical indication producers worldwide[13]. The Chinese Secretariat of oriGIn is the only permanent office of the International Organization for Geographical Indication Network in China, dedicated to building a communication platform for its members in China, sharing successful experiences in the production, management, protection and operation of geographical indication products at home and abroad, promoting international bilateral or multilateral mutual recognition of geographical indication product protection, promoting the sustainable development of Chinese geographical indication product protection, and providing more solutions and possibilities for addressing the challenges faced by geographical indication development and protection. Through exchanges, it helps and promotes more Chinese geographical indication enterprises, industry associations, e-commerce platforms, etc., to join oriGIn, share experiences in geographical indication protection at home and abroad, and jointly promote the development of global geographical indications.

China and Europe have long-term and in-depth cooperation in the field of geographical indications. It is hoped that Chinese and foreign geographical indications practitioners will exchange information in depth, maintain close business relations, and promote the formation of a broad industrial foundation for China-Europe cooperation in the protection of geographical indications. The China National Institute of Standardization will help promote cooperation between Chinese and foreign geographical indication products, promote mutual benefit and win-win results, and make the geographical indication protection system benefit the broader public.

4.3 Focusing on the Science and Technology to Promote High-quality Development of Industry

The China-EU Geographical Indication Products Expo and the China-EU Geographical Indication Agreement Forum are international platforms relying on the entry into force of the China-EU Geographical Indication Agreement, and are important carriers for trade and cultural exchanges. The theme of the expo is "Strengthening the protection of geographical indications and promoting high-quality development of industries", aiming to promote the trading, technical exchanges, information interaction, cultural integration and investment promotion of geographical indication products. The forum is of milestone significance for bridging the interests between China and Europe and enhancing their influence on the international stage. At the invitation of the Secretariat of the Organizing Committee, the China National Institute of Standardization made a keynote speech at the forum, introducing the development trend of geographical indication protection technology, the work and achievements in geographical indication protection technology standards, etc. Against the backdrop of the forum, we propose and explore new concepts and methods to further promote trade, investment and entrepreneurship, information interaction, technical exchanges and cultural integration in the field of Chinese and foreign geographical indication products. This will not only bring positive promotion to the all-round development of the geographical indication industry, but also is expected to open up a new prospect for the protection and promo-

tion of geographical indication products. The holding of the technology forum will inject new vitality into China-EU geographical indication industry cooperation, further promote high-quality development of industries, and help China-EU economic and trade cooperation enter a new stage of prosperity.

5 Summary

The protection of the distinctive quality of geographical indication products is a key link in promoting the development of regional characteristic economy, which has profound implications for the sustainable development of economic society, the promotion of international cooperation, and the protection of cultural heritage. Modern analytical technology, omics technology, quality assurance system, and classification and grading of production areas are important components of building a complete protection system for geographical indication products. This article delves into these aspects in order to provide new ideas and methods for promoting high-level protection of geographical indication products. Overall, the research on the technology of characteristic quality protection of geographical indication products plays a key role in promoting the high-quality development of the geographical indication industry. However, there are still shortcomings in China's research in these areas, and it is necessary to strengthen basic research, formulate more national standards, and engage in in-depth cooperation with international organizations to jointly promote the internationalization and high-quality development of geographical indication products.

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