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Construction of Jujube Quality and Safety Traceability System Based on Close-Range Wireless Communication Technology

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Abstract: The quality and safety of jujube fruit is the key to ensuring the healthy development of the industry. Currently, there are problems such as unreasonable use of chemical fertilizers and pesticides in the traditional cultivation and management mode of the jujube industry. This article summarizes the construction of jujube quality and safety traceability system based on close range wireless communication technology. The system collects data on the use of pesticides, fertilizers, herbicides, and hormones during jujube production, processing, and circulation through NFC, and determines traceability information through the combination of hazard analysis of hazardous substances and key control points. It has developed a flexible mechanism and method for quality and safety traceability of tropical fruits and vegetables agricultural products, meeting the flexible management and configuration of traceability content, templates, and mechanisms, Realize the convenience of promoting the agricultural product traceability platform, and build an agricultural product quality and safety traceability management system according to the management needs of Hainan Agricultural Hi-Tech Zone, realizing functions such as enterprise settlement, product testing, and traceability information collection. Provide the application of the agricultural product quality and safety traceability system for enterprises settled in the agricultural Hi-Tech Zone, improving the settlement management level, and ensuring the reliability and traceability of agricultural product safety.

Keywords: Jujube Quality , Safety Traceability, Close Range; Wireless Communication Technology

1. INTRODUCTION

Jujube is a plant belonging to the genus Jujube of the Rhamnaceous, which is rich in vitamin C, vitamin P, etc. In addition to being used for fresh food, it can be made into preserves and preserves such as honeyed dates, red dates, smoked dates, black dates, wine dates, tooth dates, etc. It can also be made into jujube paste, jujube flour, jujube wine, jujube vinegar, etc. It is an important raw material for the food industry. In 2021, China's jujube cultivation area reached 3.31 million. Standardized operations in seedling raising, planting, watering, nail opening, bud brushing, pesticide spraying, fertilizer growth regulator application, and fruit harvesting, processing, and circulation are the basis for ensuring the quality and safety of jujube fruit.

Hainan is the only tropical province in China, with the richest tropical crop resources in the country. It has unique resources to ensure national seed industry and food security, and has advantages in seed industry, tropical agricultural technology, and ecological resources in agricultural modernization. In recent years, the whole province of Hainan has been focusing on the construction of free trade ports, relying on its own advantages, and continuously creating Hainan brand agriculture and flagship tropical characteristic agriculture. The circulation methods of tropical agricultural products in Hainan are different, and the traceability mechanism of agricultural products is also different. The current traceability platform only relies on a single way to connect various links of information, which is difficult to meet the traceability needs of different types of enterprises, enterprises of different scales, and different planted products, and it is difficult to meet the diverse and flexible requirements of enterprises, consumers, and regulatory authorities for traceability information, resulting in difficulties for enterprises to collect and record traceability information, Technical personnel are unwilling to use it, and it is difficult for government departments to promote it.

Carrying out quality and safety traceability of red dates is an inevitable choice for developing export earning agriculture. Currently, achieving quality traceability is becoming a common requirement for agricultural product quality management in developed countries around the world. Countries such as the United States, the European Union, Japan, and Taiwan have successively implemented quality traceability management systems on agricultural products. China exports a large number of jujube products every year. In order to avoid export losses caused by new technical barriers, it is necessary to establish a traceability system for agricultural product quality to achieve integration with economically developed countries. Achieving quality traceability is becoming a common requirement for agricultural product quality management in developed countries around the world. Countries such as the United States, the European Union, Japan, and Taiwan have successively implemented quality traceability management systems on agricultural products.

At present, there are a large number of jujube products exported every year throughout the country. In order to avoid export losses caused by new technical barriers, it is necessary to establish a traceability system for agricultural product quality to achieve integration with developed countries with market economies. Therefore, using modern scientific and technological means, combined with the characteristics of jujube production and marketing in our city, to carry out the exploration and practice of jujube product quality and safety

traceability, and to achieve quality tracking and management throughout the process, has become an important topic and urgent task in the quality and safety management of agricultural products. Date growers, processing companies, and sellers collect and upload real-time data. The traceability system monitors, integrates, processes, and feeds back traceability data through the NFC system, and guides planting, processing, and sales entities in adjusting work deviations. Consumers can use NFC mobile phones to read NFC labels, conduct product traceability, timely understand the safety and quality information of jujube, and then make decisions about consumer behavior.

2. THE PROPOSED METHODOLOGY

2.1 Basic Requirements for Quality and Safety Traceability of Red Dates

Upon receiving consumer complaints or system feedback, regulatory authorities can promptly verify data, hazard analysis, and critical control points, thereby determining traceability information, quickly locating the node where the problem occurred, identifying the cause, and making response strategies. The main construction content of the agricultural product quality and safety traceability system includes several functional modules, including key point information management, coding management, production record management, detection management, flow direction management, traceability information management, traceability template customization, basic data, and system management.

The platform involves three types of users, namely platform administrators, enterprise management users, and consumer users. Users can perform different operations depending on their permissions. The system administrator is responsible for the daily operation and maintenance of the system, and can manage users and set permissions Enterprise management users are responsible for the management work during the production process of agricultural products in the settled enterprise, and complete the daily submission work of production management in combination with smart phones Consumer users refer to agricultural product traceability information that can be viewed through the Internet or by scanning QR codes. The jujube quality and safety traceability management system include two core contents: production history system, product traceability code generation, and information association with agricultural products. The production record system completes the unified recording and storage of production file information for listed products, thereby enabling consumers to query production record information for purchased products. The product traceability code production code system accomplishes the association of production records and specific edible agricultural products. By attaching barcode labels with product traceability codes to the packaging, product traceability is achieved.

Traceability code generation and label printing system. The traceability code is a bar code prepared using the EAN.UCC128 code coding specification. The system uses a coding encryption mechanism that has been authenticated by the National Commercial Password Management Office to compile the traceability code for the product. This code can be digitally encrypted to achieve a unique product traceability code corresponding to a packaging barcode label. By using this encoding method to carry information, various types of information such as product, producer, and production time can be associated, and information can be continuously loaded and incremented along with the circulation of the product, facilitating tracking and traceability of information. This data encoding technology has considerable controllability, which can be distributed in quantity, registered, and expired. At the same time, this encoding technology has strong anti-counterfeiting ability, and data encoding is encrypted and cannot be copied in batches. Code different outbound batches or scan the records piece by piece to record the outbound time and quantity of the date.

2.2 Composition of Jujube Quality and Safety Traceability System

There are two methods for circulation coding, namely "enterprise code reserved code points + sales code" and "enterprise code sales code". According to the uncertain characteristics of jujube nodes in the circulation process, the circulation process coding should follow the principles of uniqueness, scalability, conciseness, and scientific. Uniqueness means that a code only identifies one coding object. Extensibility refers to the fact that the code should have appropriate backup capacity to meet the needs of continuous expansion. Simplicity means that the code structure and form should be simple and clear, facilitating manual input.

Scientific means that the design of the code structure should fully consider all aspects of the actual circulation of jujube, in line with actual business processes. The system achieves basic information maintenance and information management for the production process of Hainan agricultural products through the input and integration of enterprise basic information, agricultural product basic information, input information, production area information, production environment monitoring, personnel basic information, and marketing enterprise basic information, Build a basic information database for the key points of Hainan agricultural product production base, comprehensively grasp the environmental information of the origin, provide data support for the quality and safety traceability of agricultural products, and ensure the quality and safety of Hainan agricultural products from the source of production

In 2008, two pilot units, the Nathania Wholesale Market and the Yueh jujube production and marketing professional cooperative in Xiang Cheng District, were added. The framework design for tracing the source and flow of agricultural products was completed, and certain progress was made in the development, management, use, and query of product label information codes. In 2009, on the basis of the original pilot unit, a specialized cooperative for the production and marketing of edible mushrooms for the people of Xiang Cheng District was added to further explore the applicability of the system for agricultural products other than red dates. In terms of the current use effect, it is successful.

Since the second half of 2007, we have actively explored the quality and safety traceability system for red dates. We have selected Kunshan Yue Green Red Dates Base and Nathania Wholesale Market Distribution Co., Ltd. to carry out pilot research on quality and safety traceability for red dates. In 2008, we added two pilot units, namely Nathania Wholesale Market and Yueh Red Dates Production and Marketing Professional Cooperative in Xiang Cheng District, to complete the framework design for tracing the source and flow of agricultural products, A list of restricted pesticide varieties for jujube production was proposed, and some progress has been made in the development, management, use, and query of product label information codes. Code different outbound batches or scan the records piece by piece to record

the outbound time and quantity of the date. There are two methods for circulation coding, namely "enterprise code reserved code points+sales code" and "enterprise code sales code".

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In the process of system design, development, and application, the author believes that policy and management factors such as imperfect current detection systems, incomplete certification systems, and lack of entities due to segmented management may limit the promotion of the Suzhou jujube quality and safety traceability system. Therefore, Perfecting the jujube safety standard system and inspection and detection system, establishing matching standardized management, and strengthening coordination and joint management among government management departments are the guarantees for the normal operation of the traceability system.

3. CONCLUSION

By comparing and analyzing national standards and specifications for pollution-free, green, and organic agricultural products, extracting the characteristics of key factors affecting tropical fruit and vegetable agricultural products, we have developed a flexible mechanism and method for quality and safety traceability of tropical fruit and vegetable agricultural products, meeting the flexible management and configuration of traceability content, templates, and mechanisms, achieving the convenience of promoting the agricultural product traceability platform. Determine traceability information by combining hazardous material hazard analysis with key control points and upload it to a database to trace the entire process of jujube planting, picking, processing, circulation, and sales. The development and utilization of this system is conducive to improving the quality and safety of jujube, enhancing consumer confidence, and ensuring the healthy and rapid development of the jujube industry.

4. REFERENCES

[1] Li Qingyuan, Li Junxia, Wang Congming, et al Construction of jujube quality and safety traceability system based on close range wireless communication technology [J] Chinese Fruit and Vegetable, 2022, 42 (11): 66-69

[2] Zheng Huoguo, Liu Shihong, Meng Hong, et al Construction of Grain and Oil Product Quality and Safety Traceability System [J] Chinese Agricultural Science, 2009, 042 (009): 3243-3249

[3] Yang Yun, Wei Kun Construction of agricultural product quality and safety traceability system [J] Computer Knowledge and Technology, 2015 (11X): 3

[4] Zhang Qiang, Yu Yinliang, Wang Chunsheng, et al Construction and Application of Suzhou Vegetable Quality and Safety Traceability System [J] Shanghai Agricultural Science and Technology, 2011 (01): 25-26

[5] Liu Jia Construction of agricultural product quality and safety traceability system based on two-dimensional code [J] Journal of Shandong Agricultural University: Natural Science Edition, 2014, 45 (5): 6.

[6] Ma Aijin Research on the construction of dairy product quality and safety traceability system [J] World Standardization and Quality Management, 2011 (5): 63-68

[7] Liu Meng Design and Implementation of Bee Product Quality and Safety Traceability System [D] Tianjin University, 2013

[8] He Jianhong, Li Jingdong, Zhang Li Preliminary Discussion on Railway Material Traceability Management Mode - "Quality and Safety Tracking and Tracking System for Railway Important Materials" [C]//Proceedings of the Academic Seminar of the Material Management Committee of the Chinese Academy of Railways two thousand and eight

[9] Gurui Research on the construction of drug quality and safety traceability system based on blockchain technology [J] Computer Knowledge and Technology, 2020 (2)

[10] Wu Ximing A preliminary study on the quality traceability system of food production enterprises in China

[11] Zhong Leping Research on the quality and safety traceability system of agricultural products [D] Northwest Agricultural and Forestry University, 2014

[12] Focal light source Design and Implementation of Xinjiang Fresh Agricultural Product Quality and Safety Traceability System [D] Shihezi University

[13] Zhang Guowei, Jin Guoliang, Ding Baoyong, et al Quality and safety traceability system based on agricultural product supply chain two thousand and sixteen.

[14] Huang Huizhen, Liu Shanwen Design and implementation of a quality and safety traceability system for Liancheng White Duck products [J] Agricultural Network Information, 2014 (01): 36-39.