A Preliminary Analysis of Development Status and Prospects of Blueberry Industry in China

Shaoping WU[1], Jing LIANG[1], Junwen HUANG[1]*, Hong NIE[2]*

1. School of Life Sciences, Zhaoqing University, Zhaoqing 526061, China; 2. School of Computer Science and Software, Zhaoqing University, Zhaoqing 526061, China

Abstract Blueberries have recently gained popularity as a "superfruit" among consumers worldwide. The rise of healthy eating concepts has led to widespread recognition of the nutritional content and antioxidant properties of blueberries, boosting the blueberry industry's rapid growth. Blueberry production and processing are currently major elements of the agricultural economy in many nations and regions, including the United States, Canada, and Europe. The blueberry business has developed a reasonably mature industrial chain that includes planting, harvesting, processing, sales, and other components. The blueberry industry in China started relatively late. However, with the growth of market demand and consumer attention to healthy food, the blueberry planting area has been expanding every year. Several provinces and cities in China are actively promoting the construction of blueberry planting bases and gradually expanding from planting to deep processing fields, forming diversified products, including fresh fruits, dried fruits, jams, and blueberry drinks. With advancements in technology and innovation in management models, the efficiency and market competitiveness of blueberry cultivation are progressively improving. The blueberry industry has broad prospects. On the one hand, the ongoing enhancement of consumer health needs is expected to elevate the market demand for blueberries as high-value functional foods; alternatively, the advancement of planting technology and cold chain logistics may further optimize the yield and quality of the blueberry industry. The production of deep-processed blueberry goods will become a significant highlight of industrial development, enhancing the market value. This study aimed to investigate the various categories of blueberries, the blueberry industry's current state of development, and the challenges it encounters. In summary, the blueberry sector possesses significant future potential, but it also faces problems, including planting practices, market competitiveness, and brand development. The blueberry industry can expand and industrialize due to creative developments.

Key words Blueberry industry, Planting techniques, Market competition

0 Introduction

Blueberries (*Vaccinium* spp.), which belong to the *Ericaceae* family and *Vaccinium* genus[1], are a significant economic crop that originated in North America. Archaeological findings reveal that ancient people in North America started utilizing wild blueberries around 6 000 BC. After years of cultivation and breeding, the diversity of blueberries has expanded, and their nutritional and economic value has improved, rendering them among the most popular berries worldwide. The commercial cultivation of blueberries developed in the 18th and 19th centuries as European immigrants introduced blueberry planting techniques to Europe, particularly on large-scale farms in North America. In the late nineteenth and early twentieth centuries, with the creation and advancement of refrigeration technology, blueberries became a long-distance agricultural commodity, significantly accelerating the expansion of the blueberry business[2].

After the turn of the century, technological advancements have significantly improved blueberry farming practices and yield. Breeding research on blueberries has effectively generated additional types that can respond to diverse climatic conditions in many countries, along with substantial advances in pest control, soil management, irrigation systems, and related fields. The United States became the world's leading producer of blueberries in the second half of the 20th century, and nations, including Chile, Canada, Australia, and China, followed suit in the subsequent decades[3].

Blueberries are among the top five health foods and are widely regarded as a beneficial "superfruit"[4]. Blueberries are highly valued for their rich organic acids, phenolic compounds, sugars, minerals, vitamins, fibers, and pectin[5-6]. They also possess antioxidant, anti-inflammatory, antibacterial, anti-aging, and cardiovascular protective properties[7-9]. Blueberries can be processed into blueberry wines[10-11]. As we approach the 21st century, globalization and changing market demands have accelerated the expansion of the blueberry industry. Deep-processed blueberry products, including blueberry juice and sauce, have emerged to fulfill the needs of various customers. With the rise of healthy lifestyles, blueberries, a superfood abundant in antioxidants and other minerals, have progressively been scientifically established to provide health advantages, driving the increasing demand for high-quality blueberry products.

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Shaoping WU, doctoral degree, lecturer, research fields: genetic breeding of fruit trees.

*Corresponding author. Junwen HUANG, doctoral degree, associate professor, research fields: utilization and development of southern medicinal resources; Hong NIE, master's degree, associate professor, research fields: bioinformatics.

The blueberry industry in China commenced somewhat late but has grown rapidly. China's blueberry planting area and yield have increased significantly since the turn of the century, rendering it among the world's major blueberry producers. With the expansion of the Chinese market and rising consumer demand, the market space for blueberries is expanding, becoming a new highlight in boosting China's agricultural economy.

1 Main categories of the blueberry industry

Blueberries are nutritious berries originating from North America, particularly North Carolina, the United States, and similar regions. Through extensive breeding and refinement, numerous blueberry varieties capable of thriving in diverse climatic conditions worldwide have been developed. These berries are popular for daily consumption and are significant in the production of various processed products.

The blueberry industry is primarily classified based on distinct planting methods and various characteristics. Blueberries are typically classified as highbush (*Vaccinium corymbosum* L.), half-highbush (*V. corymbosum* × *V. angustifolium*), lowbush (*Vaccinium angustifolium* Aiton), and rabbiteye (*Vaccinium ashei* Reade) based on their qualities[12-13].

(i) Highbush includes both southern and northern bush blueberries. Highbush blueberries grow quickly, have good fruit quality, and are delicious, whereas Beigaocong blueberries have great cold resistance, large fruit size, and excellent flavor.

(ii) Half-highbush blueberry: It is a cross between a dwarf bush blueberry and a highbush blueberry. It has high cold tolerance, good fruit quality, large and juicy grains, and a pleasant taste.

(iii) Lowbush: It is a wild blueberry species with short stature, high cold tolerance, sluggish growth, tiny fruit size, and pleasant flavor.

(iv) Rabbiteye: Its fruit resembles rabbit eyes before it matures and is grown from a wild species. Strong drought and heat resilience, tall tree form, enormous fruit size, and somewhat sour flavor.

2 Development status of the blueberry industry

2.1 Production status of the blueberry industry Blueberries, recognized for their high nutritional value and increasing market demand, have garnered significant attention in terms of their production. As globalization deepens and consumer health consciousness rises, the production and consumption of blueberries have entered a phase of swift expansion. Key production centers are identified in North America, Europe, and Asia. North American countries, including the United States, Canada, and Chile, are leading global blueberry producers. In particular, the United States benefits from abundant solar resources and boasts advanced technology and extensive experience in blueberry processing and market development. Similarly, Canada and Chile are pivotal in traditional blueberry production, significantly contributing to off-season and high-end market supply.

China has rapidly transitioned from a major blueberry-producing nation to a formidable one. Recently, China's blueberry production has experienced exponential growth, encompassing advancements in cultivation techniques, variety improvement, facility agriculture, fresh fruit supply, and processing. The Yunnan region, with its distinctive geography and favorable climate, has emerged as a crucial blueberry production hub in China and globally. Furthermore, China has continually refined blueberry cultivation practices, including water and fertilizer management, pest control, post-harvest storage, and processing. Through technological innovation and enhanced management, China has not only guaranteed blueberry production and quality but also aligned with international standards in several aspects, bolstering the global market competitiveness of Chinese blueberries.

In 2022, China produced 525.310 MT of blueberries on 77.641 ha of land (https://east-fruit.com/en/horticultural-business/interviews/china-is-the-center-of-the-blueberry-world/). The growth of China's blueberry industry has spurred the modernization of local agriculture, positively impacting local economic development and farmer incomes. Simultaneously, China's rapid development in this sector has enriched the global blueberry market with high-quality products, expanding the supply options available worldwide.

2.2 Regional status of the blueberry industry In China, the blueberry industry has garnered widespread attention owing to the growing popularity of healthy eating habits and a surge in demand for functional foods. Blueberries, known for their nutritional value and economic potential, have experienced significant industrial development across various regions, including the Northeast, Northwest, and Southwest. The Northeast has experienced the most rapid growth, which can be attributed to its favorable natural conditions, technological advancements, and increasing market demand.

The rapid growth of blueberry cultivation in Northeast China is primarily due to its unique natural environment. The region's temperate climate, characterized by distinct seasons, long periods of low temperatures, and short days in winter, provides ideal conditions for the growth of temperate fruits such as blueberries. Moreover, the soil types in Northeast China are particularly conducive to blueberry cultivation, further enhancing growth conditions.

Technological advances have played a crucial role in the region's blueberry industry. Through continuous improvement and optimization, Northeast China has achieved a high level of blueberry-planting technology. Research institutions and enterprises in the area have made significant strides in enhancing blueberry germplasm resources and innovating cultivation techniques. These advancements have increased blueberry yield and quality, establishing a solid foundation for the industry's sustainable development.

The growing market demand is another key factor driving the rapid expansion of the blueberry industry in Northeast China. As living standards rise and health awareness increases, there is a

growing focus on functional foods with health benefits. Blueberries, which are rich in antioxidants and potentially beneficial for cardiovascular health and vision improvement, have become a preferred health food choice. Their excellent taste and appearance have made them highly popular in the market. Northeast China, a prominent blueberry-producing area in China, has increased production and significantly contributed to meeting the market demand.

Despite these advancements, challenges remain in improving the blueberry industry in Northeast China. These include the need for further innovation in blueberry varieties, advancements in deep-processing technology, brand building, and the construction of market channels. Moreover, compared to international standards, blueberries from Northeast China still exhibit quality and value-added gaps. Addressing these challenges is crucial for the continued growth and competitiveness of the region's blueberry industry.

2.3 Current technological status of the blueberry industry The blueberry industry has recently experienced rapid growth; however, there remains substantial scope for enhancing its technological aspects in planting, management, and processing.

(i) Planting techniques are evolving towards greater refinement. Modern cultivation practices frequently include scientifically planned planting areas, soil acidity adjustments (using substances such as sulfur powder or aluminum sulfate), and precise irrigation methods (drip and micro-sprinkler irrigation) to meet blueberries' stringent growth requirements. Moreover, certain areas have started to implement protective measures, including frost nets and sunshades, to bolster blueberry production stability during extreme weather.

(ii) Variety improvement technology is continuously advancing. Developing new blueberry varieties focuses on enhancing disease resistance, yield, and adaptability. Through traditional hybrid breeding and molecular biology methods, varieties suited to diverse climates have been developed. In China, varieties, including Nan Gao Cong and Rabbit Eye blueberries, have been extensively introduced, facilitating cultivation across multiple regions.

(iii) Green prevention and control technologies are being increasingly adopted. In pest management, blueberry cultivation is transitioning to biological agents (*Bacillus subtilis*) and physical control methods (sticky insect traps and nets), thereby reducing reliance on chemical pesticides and ensuring fruit safety and environmental sustainability.

(iv) The level of deep processing and intelligent adoption in the blueberry industry is relatively low. Deep processing primarily revolves around traditional methods, such as dried fruit and juice production, with insufficient development of high-value-added products, such as functional foods and cosmetics. Moreover, using intelligent management technology in cultivation, including data monitoring and precision planting, remains in its early stages.

Overall, while the blueberry industry's technology is advancing swiftly, there is a need to accelerate the adoption of intelligent and green technologies, drive the upgrading of the entire industry chain, and achieve high-quality, sustainable development.

2.4 Policy status of the blueberry industry As the blueberry industry rapidly expands, national and local governments have implemented various policies to support its cultivation, processing, and marketing, propelling the industry towards greater scale and modernization.

(i) Policy support for the agricultural sector has increased, with blueberries recognized as a specialty agricultural and efficient economic crop. They benefit from subsidy policies similar to those for grain crops, including subsidies for planting, seed, and agricultural machinery acquisition. These incentives encourage farmers to expand their cultivation areas and boost their production. Additionally, certain provinces and cities have allocated special funds to establish blueberry planting bases and promote related technologies.

(ii) Policies promoting green agriculture and sustainable development are driving the upgrading of the blueberry industry. The government advocates ecological agriculture and supports green planting technologies and organic certification systems. Many local governments have established green development standards for the blueberry industry, encouraging the use of biopesticides, reducing chemical fertilizer use, and incentivizing enterprises and farmers to obtain organic and green certifications through policy incentives, thereby enhancing the market competitiveness of blueberry products.

(iii) The blueberry industry is considered a pivotal sector contributing to the revitalization of rural economies. Through its development, the industry has enhanced rural economic benefits and fostered employment opportunities. The government actively promotes models integrating blueberries with tourism and culture, including "blueberry + tourism" and "blueberry + culture," thereby facilitating the integrated development of agriculture and other sectors.

(iv) Policies aimed at market expansion and brand building are being strengthened. The government encourages blueberry enterprises to participate in domestic and international exhibitions and market promotion activities, facilitating the entry of blueberry products into the international market through regional brand building, standardized production, and quality certification. Moreover, subsidies for cold-chain logistics have reduced transportation costs, ensuring a fresh supply of blueberries.

In summary, policy support has significantly aided sustainable growth in the blueberry industry. However, industry chain support policies and international market development strategies must be enhanced in the future.

3 Challenges faced by the blueberry industry

3.1 Climate adaptation issues The blueberry industry encounters significant challenges in adapting to climate change. Blueberries require a specific growth environment and are highly sensitive to climatic factors, including temperature, humidity, and light. Blueberries thrive in temperate climates, particularly in regions with cold winters alternating with warm summers, which en-

sures appropriate dormancy and growing seasons. However, as global climate change intensifies, traditional blueberry-growing areas have experienced unusual climatic conditions, including extended summer heatwaves or unseasonably mild winters, hindering effective plant dormancy and severely impacting blueberry yield and quality. Moreover, blueberries require precise precipitation levels; excessive rainfall can lead to pests and diseases, whereas insufficient moisture affects fruit development. Therefore, blueberry cultivation necessitates meticulous climate control and water management. In southern China, the excessively humid and warm climate hampers blueberry growth adaptability, leading to unstable yields. Conversely, although northern regions offer a more suitable climate, the harsh winters challenge the wintering capacity of blueberries.

3.2 High cultivation cost Although blueberry cultivation techniques are evolving, they still entail significant investments, encompassing planting equipment, fertilizers, and water sources. In particular, producing high-quality blueberries requires substantial manual labor for tasks such as pruning and pest management, contributing to higher production costs. These costs maintain blueberries at a relatively high market price, potentially limiting their widespread popularity. Furthermore, blueberries have a relatively long planting cycle, typically taking 3 – 5 years from planting to achieve the first substantial yield. This extended cycle means that farmers initially incur higher maintenance costs and face a longer wait for a return on their investment. Additionally, blueberries require meticulous harvesting and processing. Their brief maturity window and sensitivity to climate change necessitate hand-picking, further escalating the labor costs.

3.3 Difficulty in pest and disease control The blueberry sector faces another significant challenge in efficiently managing pests and pathogens. Blueberries are vulnerable to a variety of pests and illnesses during cultivation, including fungal diseases such as anthracnose, gray mold, and stem rot, as well as pests such as thrips and aphids. These pests and diseases affect blueberry output and lower fruit quality, jeopardizing the industry's economic sustainability. Pest and disease management issues are diverse.

First, Blueberries are extremely susceptible to chemical pesticides[14]. Traditional pesticides can harm plants or exceed residual limits, posing challenges to food safety and marketability. Second, the different climatic variables in blueberry-growing regions complicate the development of unified management measures for pests and diseases. Finally, dense blueberry planting can promote disease transmission, especially in high-humidity conditions where infections thrive and spread rapidly, making prevention and control more difficult[15].

3.4 Intense market competition The blueberry industry also experiences intense market competition. As consumer health awareness grows, blueberries, renowned for their antioxidant and nutrient content, have surged in popularity, driving demand. However, this surge has attracted numerous producers, intensifying industry competition. The challenges are twofold.

(i) Global competition: The global blueberry market is highly competitive, particularly with major producing countries, including the United States, Canada, Chile, and Australia. These nations boast large-scale production and superior quality and dominate the international markets. As globalization accelerates, foreign blueberries are entering the Chinese market through exports and e-commerce, posing significant challenges to local producers in terms of price and quality and creating a substantial competitive advantage.

(ii) Domestic market dynamics in China: The Chinese blueberry industry is rapidly expanding, with production in many regions increasing. However, variations in planting techniques, management levels, and market access lead to wide production disparities and inconsistent quality. The influx of low-quality blueberries in the market not only affects consumer experiences but also escalates price competition, exerting immense market pressure on small-scale farmers.

4 Measures for the sustainable development of the blueberry industry

4.1 Scientific site selection and regional optimization layout

Blueberries require certain temperature conditions, and climate change presents several problems for their production. To increase the climatic adaptation of the blueberry sector, we might begin with the following aspects:

(i) The planting areas should be properly designed. Priority should be given to finding acceptable places for growing blueberries based on their climatic needs to avoid blind expansion in high-risk areas. The blueberry development environment must be optimized to mitigate the impact of harsh weather by improving soil, accurate irrigation, and installing drainage systems. Second, the variety of breeding and promotion should be enhanced. The cultivation of blueberry cultivars with great stress tolerance, particularly those that can withstand extreme temperatures, cold, drought, and humidity, should be increased.

(ii) It is necessary to introduce and promote blueberry cultivars that are suited to varied regional climatic conditions, resulting in more diverse planting and diversifying climate risks. Intelligent management technologies are encouraged. A meteorological monitoring and early warning system was established to track weather changes in real time. Intelligent irrigation, precise fertilization, and other technologies can be used to change production schedules dynamically. Blueberry bushes' capacity to survive in adverse weather conditions can be improved by employing agricultural structures, including frost nets and sun shelters. Finally, policy support and collaboration structures should be enhanced.

(iii) The government should raise funds, encourage technological research and development, build demonstration bases, and provide climate insurance coverage. A collaborative mechanism was established through industry partnerships and information exchange to combat climate change and assist the blueberry sector's high-quality growth. The blueberry sector can achieve sustainable

growth by implementing thorough strategies to adapt to climate change.

4.2 Variety improvement and diversified planting, optimizing planting techniques and management The high cost of blueberry production, which includes seedling prices, site improvement, facility building, and managerial expenditures, is a significant barrier to industry growth. The following response options were offered in the areas of technology, management, and policy support:

(i) Adjusting the planting method to decrease costs per unit area. Effective blueberry production practices, including dense planting and intercropping, must be promoted to maximize land use and yield per unit area. The amount of physical work required for planting can be minimized by introducing large-scale and mechanical processes. (ii) Encouraging high-quality, resistant cultivars. Breeding and introducing disease- and pest-resistant, low-fertility, and adaptable blueberry cultivars can minimize disease losses and reliance on pesticides and fertilizers, as well as reduce long-term management expenses. It promotes circular agriculture and minimizes resource waste. Fruit leftovers can be used to make organic fertilizers and recycled resources. Water-saving irrigation methods, including drip and micro-sprinkler irrigation, should be promoted to minimize water consumption and irrigation expenses. (iii) Technical support and training should be improved. Systematic training and technical direction should be provided to farmers with the assistance of the government and research institutes to enhance production management and eliminate cost waste due to a lack of technology. Finally, policy and financial assistance must be improved. To reduce growers' early investment pressure, the government could provide incentives, including seedling subsidies and low-interest loans. Simultaneously, agricultural insurance measures should be created to safeguard producers from risks. Blueberry cultivation costs can be effectively reduced through production optimization, technological advancements, and regulatory assistance, contributing to the industry's long-term development.

4.3 Promoting green prevention and control and using drugs scientifically Blueberries are vulnerable to pests and diseases during cultivation, including root rot, downy mildew, aphids, and fruit flies, which adversely affect their productivity and quality. The following steps can be implemented to successfully prevent and manage pests and illnesses.

(i) Improving the management of planting environments. Planting sites with high topography and sufficient drainage should be selected to minimize excess soil moisture and limit bacterial development. Simultaneously, improving the planting structure through appropriate crop rotation and intercropping can help lower the risk of disease and insect transmission.

(ii) Considering disease- and pest-resistant cultivars. The introduction and production of blueberry cultivars that are resistant to diseases and pests can reduce drug reliance and decrease the likelihood of disease and pest recurrence at the source. Green preventive and control technologies are emphasized. Biological control strategies, including the use of natural enemies (predatory mites and ladybugs) to manage pest populations or microbial agents (Bacillus subtilis) to control illnesses, must be encouraged. To prevent the use of excessive chemical pesticides, physical approaches, including placing bug nets and sticky insect plates, can be combined. Simultaneously, the planting structure should be improved using a suitable crop.

Insecticides are used scientifically. During seasons of high insect and disease prevalence, employing low-toxicity and low-residue pesticides is critical to avoid misuse and minimize negative environmental and fruit quality consequences.

(iii) Improving monitoring and technical guidance. A pest and disease monitoring system should be established, and warnings should be issued regularly. By providing training and technical services, farmers will be better able to identify and control pests and illnesses. Blueberry pests and diseases can be efficiently controlled by implementing a comprehensive set of ecological, physical, biological, and chemical management measures, encouraging the healthy growth of the industry.

4.4 Innovating sales models and enhancing brand effectiveness The blueberry sector is becoming more competitive as market demand rises, as seen by insufficient brand influence, a single sales channel, and substantial product uniformity. To increase market competitiveness, the blueberry sector should take the following steps:

(i) It is recommended that brand building be fostered. By building regional public brands and enterprise-independent brands, we want to improve our goods' market awareness and added value. Increasing brand advertising and certification, including organic and green certifications, highlighting the health benefits of blueberries, and boosting customer confidence is proposed.

(ii) Increasing sales channels is recommended. E-commerce platforms should be built intensively, the convergence of online and offline blueberry sales should be encouraged, and market reach should be broadened.

(iii) Enhancing the cold chain logistics system, increasing transportation efficiency, ensuring product freshness and quality, and satisfying the needs of the premium market are recommended. The development of diverse items is encouraged. Deep processing of blueberries to produce high-value-added goods, including blueberry drinks, dried fruits, functional foods, and cosmetics, can fulfill the demands of various consumer groups with diverse product combinations and improve market competitiveness.

(iv) Improving market research and data exchange is recommended. A supply and demand analysis and warning mechanism for the blueberry market should be created to assist producers in arranging reasonable production plans and minimizing blind growth and price rivalry. Simultaneously, industry partnerships promote resource integration and increase overall competitiveness. Through brand development and channel expansion, with product innovation, the blueberry sector can differentiate itself in a competitive market and encourage high-quality development.

5 Development trends and prospects of the blueberry industry

In the current environment of globalization and sustainable development, the blueberry sector, as a dynamic branch of the agricultural industry, merits a thorough examination of its development patterns and potential. We can forecast the blueberry industry's future development path by analyzing technical innovation, product diversification, industry integration, brand creation, green development, and sustainable planting. Technological innovation and product variety are key themes in the blueberry industry's growth.

The forms and uses of processed blueberries may continue to develop because of extensive studies on their nutritional value and customers' growing interest in healthy foods. From dried blueberries and fruit juices to health and wellness items, product diversity and added value are increasing. Technological innovation encompasses the optimization of cultivation techniques (improving blueberry stress resistance and increasing yield and quality through biotechnology) and innovation in processing techniques (adopting modern cold chain logistics and deep processing technologies) to maintain the best state of products during storage and transportation, along with the development of new blueberry products with greater market potential.

Business integration and brand building are two major development trends in the blueberry industry. As market rivalry intensifies, acquisitions, partnerships, and brand-building efforts within the sector will increase. Enterprises can realize economies of scale and increase market competitiveness by integrating and pooling resources and talents. Brand development is critical for increasing product-added value and achieving consumers' high-quality expectations. Efficient brand creation may enhance market recognition and loyalty for blueberry products, boosting market competitiveness.

Furthermore, green development and sustainable agriculture are key trends in the blueberry sector in the future. With growing environmental consciousness and consumer preferences for organic and pollution-free products, sustainable planting methods that limit fertilizer and pesticide usage through organic certification will become the industry's development path. Promoting these planting patterns reduces the negative impact on the environment and offers customers safer and better food options, resulting in the enterprise's long-term sustainable development.

6 Conclusions

After completing an extensive study and analysis of the current state of the blueberry sector, we reached the following conclusions. As a fruit with high nutritional content and strong market demand, the rapid development of the blueberry business is critical for improving the agricultural economy, conserving the environment, and fostering health sector growth. Despite its rapid growth, the blueberry sector faces several obstacles, including poor production standards, outmoded storage and transportation equipment, an incomplete industrial chain, and a lack of uniformity in industrial development.

In response to the development of China's blueberry industry, scientific and technological innovation efforts should be increased, high-quality blueberry varieties suitable for diverse regions of China must be selected, and the industry's technological level must be enhanced by transforming scientific research achievements. Concurrently, we should aggressively pursue the domestic market, enhance consumer knowledge of blueberry products, and establish a devoted customer base.

Furthermore, developing collaboration among various links in the industrial chain, improving product quality and service levels, and increasing the brand's market competitiveness are essential. In terms of policy support, the government should implement more favorable policies, including tax breaks and financial assistance, to encourage the growth of the blueberry industry.

In brief, the long-term development of the blueberry industry necessitates collaborative efforts from a variety of sectors, including production, technology, marketing, and policy. The blueberry industry's future development prospects will improve even further by continually optimizing various links in the industrial chain, boosting product quality and service standards, developing a comprehensive market information platform, and obtaining strong government backing.

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Determination of Total Number of Colonies in Food (GB 4789.2-2022). The plate colony counting method was used for three times, and the final results were averaged.

2.4.3 Sensory evaluation method. Twenty individuals (10 males, 10 females) were selected who were representative, trained, and able to accurately describe sensory experiences. Students of food specialty who had similar food sensory experience and understood the characteristics and evaluation criteria of preserved peach with milk flavor formed a fixed sensory evaluation group. The comprehensive sensory evaluation of preserved peach with milk flavor was carried out from four aspects of color, taste, shape and flavor, and the final result was taken as the average score of sensory evaluation. The total score is 100 points, in which the color accounts for 30 points, including uniformity and transparency; the taste accounts for 30 points, including sweetness and sourness and chewiness; the shape accounts for 20 points, including integrity and texture; the flavor accounts for 20 points, including milk flavor, fruit flavor and no odor.

2.5 Determination results

2.5.1 Results of physical and chemical indicators. The total sugar content of the preserved peach with milk flavor was 61.6% by Fehling solution method, the moisture content was 20.78% by drying method, and the fat content was 0.2% by Soxhlet extraction method.

2.5.2 Results of microbiological indicators. The total bacterial count of preserved peach with milk flavor was ≤40 CFU/G by plate counting method.

2.5.3 Results of sensory evaluation. The preserved peach with milk flavor has light yellow color, bright color, uniform and consistent finished product and no impurities, and has the characteristics of rich milk flavor, sweet and sour taste, moderate hardness and chewiness of defatted pure milk powder, full and complete shape, no stickiness, no sand return, sugar flow and the special aroma of fragrant and crisp peaches. The results showed that the optimum processing technology of preserved fruit was as follows: the thickness of fragrant crisp peach slices was 9 – 10 mm, the formula of color protection liquid was composed of 3% sodium chloride, 2.5% sodium citrate and 1% calcium chloride, hardening treatment for 1 h, the addition of white sugar was 50%, the cooking time was 15 min, and the addition of skim pure milk powder was 7%. Under the condition of soaking in sugar for 4 h, after baking at 60 ℃ for 10 h, the product was light yellow, bright color, moderate sweet and sour, rich in nutrition, rich in milk flavor, and good compound taste.

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