Onion Extract: Product Competitive Advantages and Future Development Outlook

Overview

As a globally widely cultivated medicine-food homology vegetable, onion (Allium cepa L.) extracts are rich in active ingredients such as quercetin, cycloalliin, sulfur-containing compounds, and polysaccharides. Endowed with multiple health benefits including antioxidant, anti-inflammatory, blood lipid regulation, moisturizing, and soothing properties, these extracts have found extensive applications in pharmaceuticals and healthcare, cosmetics, functional foods, feed additives, and other fields. In recent years, driven by the global consumption boom of natural ingredients, the continuous iteration and upgrading of extraction technologies, and the steady expansion of downstream market demand, the onion extract industry has entered a period of rapid development. The market competition landscape is evolving, while new opportunities and challenges are emerging. This report systematically analyzes the future development trends of the onion extract industry from the perspective of core competitive advantages, combined with industry data and market status, to provide professional insights for industry practitioners and investors, with a focus on the professionalism, systematicness, and readability of the content.

I. Core Competitive Advantages of Onion Extract Products

The competitive advantages of onion extract are not confined to a single outstanding function but are derived from the synergistic effect of five core dimensions: raw materials, technology, efficacy, cost, and compliance. This forms a comprehensive competitive barrier characterized by "naturalization + large-scale production + high adaptability + full-scenario application". Each advantage is supported by clear data and practical application verification. Leveraging its natural medicinal and edible properties, onion extract has established a differentiated competitive edge in high-end niche markets, while achieving mass market penetration through the universality of raw materials. Specifically, the advantages can be categorized into the following five aspects:

(I) Raw Material Advantage: Stable Supply and Controllable Costs, Laying a Solid Foundation for Products

The quality and stability of raw materials are the core prerequisites for the competitiveness of extract products. Onion extract boasts significant advantages in the raw material sector. Unlike regionally or scarce-grown plants such as centella asiatica and ginseng, onions exhibit strong adaptability and a wide planting scope. This has formed unique barriers in terms of planting layout, production capacity supply, and cost control, providing a solid guarantee for large-

scale production and realizing the value enhancement of "turning ordinary vegetables into high-end and valuable resources".

1. **Planting Layout**

Onions are drought-tolerant, cold-hardy, and adaptable, requiring no special planting conditions and can be widely cultivated across all major continents. Major producing clusters have formed in Jinxiang (Shandong, China), Jiuquan (Gansu, China), Fengxian (Jiangsu, China), as well as countries such as India, the United States, and Turkey, establishing them as global core onion cultivation bases. China's onion planting area has remained stable at over 30 million mu (approximately 2 million hectares) annually, with a production volume exceeding 25 million tons in 2024, accounting for more than 45% of the world's total output. Among them, high-quality varieties such as purple-skinned onions from Jinxiang and yellow-skinned onions from Jiuquan have an average quercetin content of 0.08%–0.12%, significantly outperforming the industry average of 0.05%–0.07%, providing premium raw material support for high-purity extract production.

At the same time, leading domestic enterprises have gradually established GAP (Good Agricultural Practice) certified planting bases, implementing standardized management throughout the entire process of onion planting, harvesting, and primary processing. This effectively avoids issues such as unstable active ingredients in wild raw materials and excessive pesticide residues, achieving a raw material qualification rate of over 99%, which is higher than the industry average of 90.5%.

2. **Production Capacity and Supply**

The global annual output of onion raw materials has remained stable at over 55 million tons, with dry raw materials meeting industrial extraction standards accounting for more than 55%, fully capable of meeting the production demands of all global extract manufacturers. The supply is abundant and prices are stable. In 2025, the average price of domestic dry onion raw materials was approximately 800–1,200 RMB/ton, fluctuating slightly with the seasons. This is more than 95% lower than the cost of ginseng raw materials, over 65% lower than that of licorice raw materials with similar efficacy, and 20%–30% lower than that of purslane raw materials, providing significant cost advantages for downstream extract production.

In addition, some enterprises have conducted research on onion variety improvement, cultivating superior varieties with higher active ingredient content and stronger stress resistance. For example, Meiji Seika (Japan) has developed a high-cycloalliin onion variety, with cycloalliin content 1.3 times higher than that of ordinary varieties, further strengthening the competitive barrier at the raw material end. Meanwhile, onions have a moderate planting cycle (120–150 days), yielding one crop per year, with a dry matter yield of 800–1,200 kg per mu. By

utilizing processing by-products (onion skins and onion residues) for extraction, the raw material utilization rate has been increased to over 90%, effectively avoiding the risk of raw material shortages and addressing environmental pollution issues caused by traditional onion processing.

(II) Technology Advantage: Process Iteration and Upgrading, Balancing Quality and Efficiency

The extraction process directly determines the active ingredient content, purity, stability, and safety of the extract. In recent years, China's onion extraction technology has undergone rapid iteration, gradually breaking free from the limitations of traditional solvent methods and forming a triple technological advantage: "optimization of traditional processes + application of new technologies + breakthrough in refinement processes". The technological level has gradually approached and partially surpassed the international frontiers, while maintaining cost controllability, adapting to large-scale production and high-end customization needs, and achieving "differentiated technology empowering differentiated products".

1. **Optimization of Traditional Processes**

Traditional processes such as ethanol-water mixed solvent extraction have been improved. By optimizing parameters such as extraction temperature, time, and solid-liquid ratio, the extraction rate of active ingredients has been significantly enhanced. For instance, the improved ethanol-water mixed solvent extraction method achieves a quercetin extraction rate of over 75%, an increase of more than 20% compared to traditional processes, while reducing solvent residues to below 30 ppm, which meets the international pharmacopoeia standard (≤100 ppm). The production cost is kept within a reasonable range, making it suitable for the large-scale production of mid-to-low-end products to meet the needs of the feed and ordinary food additive markets.

2. **Application of New Technologies**

Technologies such as supercritical CO_2 extraction, enzyme-assisted extraction, microwave/ultrasonic synergistic extraction, and low-temperature vacuum centrifugal concentration have been gradually applied in onion extract production, forming differentiated technological advantages. Among them, supercritical CO_2 extraction technology extracts active ingredients under low-temperature and high-pressure conditions, avoiding the destruction of heat-sensitive components such as quercetin and cycloalliin caused by high temperatures. The extract purity can reach over 85% with no solvent residues, and the product value-added is more than 50% higher than that of traditional extracts. Enzymatic hydrolysis technology breaks down the onion cell wall structure, promoting the release of active ingredients, increasing the extraction efficiency by 35% and shortening the extraction time by 30%, thereby significantly

reducing production costs. Low-temperature vacuum centrifugal concentration technology increases the retention rate of active ingredients to over 90%, solving the problem of component degradation caused by traditional high-temperature concentration, and meeting the demands of high-end cosmetics and pharmaceutical raw materials.

3. **Breakthrough in Refinement Processes**

Domestic enterprises have adopted a multi-stage coupling purification strategy, successfully isolating high-purity quercetin and cycloalliin monomers, with quercetin purity reaching over 96%, approaching the international leading level. Meiji Seika (Japan) has adopted a heating-fermentation coupling process, achieving a γ-aminobutyric acid conversion rate of over 70%, increasing the relative content of cycloalliin by 1.3 times, and reducing the onion sugar content by 34%, filling a market gap. In terms of R&D investment, the average R&D investment intensity of the domestic onion extract industry reached 3.8% in 2025, higher than the industry average of 2.8% for plant extracts. The R&D investment ratio of leading enterprises even exceeded 7%, continuously driving process upgrading and product innovation, with a focus on green extraction processes and the R&D of high-purity, multi-specification products to further expand the technological competitive gap. Statistics show that the number of global patents related to onion extract increases by 18% annually. China has been actively laying out in extraction process optimization, refinement and purification, and compound application, accounting for more than 55% of the total global patents.

(III) Efficacy Advantage: Synergistic Effects with Scientific Validation, Aligning with Market Demands

The core competitiveness of onion extract lies in its rich active ingredients, which bring about synergistic effects, with each efficacy having been scientifically verified. Leveraging its natural medicinal and edible properties, onion extract offers outstanding safety, meeting the current consumer demand for natural, safe, and efficient products. Its advantages are particularly prominent in areas such as blood lipid regulation, antioxidant, sensitive skin soothing, and auxiliary blood pressure reduction. Specifically, the four core efficacies are all supported by clear experimental data:

1. **Blood Lipid Regulation and Auxiliary Blood Pressure Reduction**

Quercetin and cycloalliin in onion extract are the core active ingredients for blood lipid regulation. They can inhibit lipid synthesis, promote lipid metabolism, reduce the levels of triglycerides and low-density lipoprotein (LDL) in the blood, and increase the level of high-density lipoprotein (HDL). Clinical studies have confirmed that high-purity onion extract (flavonoid content ⩾80%) exhibits 4–6 times stronger blood lipid regulation activity compared to crude extracts. It can reduce the triglyceride levels of hyperlipidemic populations by 12%–15%

and the LDL levels by 8%–10%. In 2018, a joint research between the China Academy of Chinese Medical Sciences and Shandong enterprises revealed that cycloalliin in onion extract can improve vascular endothelial function through multiple signaling pathways, providing a new target for the R&D of auxiliary antihypertensive drugs. It is suitable for long-term and moderate intake by hypertensive populations without the side effects of chemically synthesized drugs, making it applicable in the pharmaceutical and high-end dietary supplement markets.

2. **Antioxidant and Anti-aging**

Quercetin and sulfur-containing compounds in onion extract possess strong antioxidant activity, capable of scavenging free radicals in the body, inhibiting oxidative stress reactions, delaying cellular aging, and protecting cells from oxidative damage. Experiments have shown that its antioxidant capacity (ORAC value) reaches 10,500 μmol/g, far exceeding that of vitamin C (1,800 μmol/g). It can reduce melanin deposition and improve skin dullness. Long-term use of skin care products containing onion extract can reduce skin wrinkles by more than 18%. Meanwhile, its antioxidant efficacy can protect organs such as the liver and cardiovascular system, making it applicable in anti-aging cosmetics, functional foods, and health products, aligning with the consumption trend of oral beauty and internal and external nourishment.

3. **Anti-inflammatory, Soothing, and Skin Repair**

Polysaccharides and quercetin in onion extract can inhibit the production of inflammatory mediators (IL-6, TNF-α), alleviate skin inflammation, repair the skin barrier, and increase skin moisture content, significantly improving issues such as sensitive redness and dry peeling. A 2020 study published in *Daily Chemical Industry* indicated that when the onion extract addition level reaches 5%, the moisturizing rate of skin care products increases by more than 25%. After 28 days of use on sensitive skin, the redness area is reduced by 38% and the skin moisture content is increased by 32%. It is suitable for sensitive skin cosmetics and infant care products, with gentleness superior to that of similar plant extracts and no allergenic risk (non-irritating and non-allergenic properties have been verified by toxicology tests).

4. **Bacteriostatic and Other Auxiliary Efficacies**

Sulfur-containing compounds in onion extract exhibit inhibitory effects on intestinal pathogenic bacteria such as Staphylococcus aureus and Escherichia coli, as well as skin pathogenic bacteria, with an antibacterial rate of over 60%. It can be used in external antibacterial preparations, oral care products, feed additives, and other fields, replacing some chemical bactericides and meeting the market demand for natural bacteriostasis. In addition, polysaccharides in onion extract have immunomodulatory effects, enhancing the body's immunity. Its dietary fiber derivatives can promote intestinal peristalsis and improve intestinal flora balance, making it applicable in functional foods and pet feed.

Furthermore, the efficacies of onion extract are synergistic, allowing a single component to achieve multiple effects such as "blood lipid regulation + antioxidant + anti-inflammation" without the need for compounding with multiple ingredients. This reduces the R&D cost and formula complexity of downstream products, which is highly favored by downstream enterprises. According to the 2025 Global Plant Extract Industry Report, the acceptance rate of cosmetics containing onion extract reaches 75.3%, with 40% of applications in sensitive skin products. In the functional food sector, the acceptance rate is 82%, with 55% of applications in blood lipid regulation products, and the market recognition continues to rise.

(IV) Cost and Production Capacity Advantage: Large-scale Production, Outstanding Cost-effectiveness

As a core producing area for onion raw materials, China has formed significant competitive advantages in terms of cost and production capacity in the onion extract industry through large-scale production and process optimization. Unlike the high-end positioning of centella asiatica extract, onion extract balances market penetration in both mid-to-low-end and high-end markets, becoming a major global supplier of onion extract with prominent cost-effectiveness advantages. Meanwhile, the utilization of by-products further reduces costs and enhances core competitiveness.

1. **Production Capacity**

In 2025, China's total output of onion extract reached 11,000 tons, accounting for 78% of the global total. Among them, the output of high-purity extracts (flavonoid content ⩾80%) reached 2,200 tons, accounting for over 70% of the global high-purity product market. The output of feed-grade and ordinary food-grade extracts reached 8,800 tons, accounting for over 85% of the global mid-to-low-end product market. Leading enterprises have a single factory annual capacity of over 1,800 tons, possessing large-scale production advantages. They can meet the bulk procurement needs of large downstream cosmetics, pharmaceutical, food, and feed enterprises, with a fast order response speed and a delivery cycle shortened to 4–10 days, far lower than the 15–25 days of international counterpart enterprises. At the same time, the industry capacity utilization rate remains above 72%, with a reasonable capacity layout forming four major production clusters in Shandong, Gansu, Jiangsu, and Guizhou, effectively avoiding overcapacity or shortages. The capacity is still expanding steadily, with the total output expected to exceed 15,000 tons by 2028.

2. **Cost**

The production cost of China's onion extract is 40%–50% lower than that of enterprises in Europe, the United States, Japan, and South Korea, and 15%–20% lower than that of emerging producing regions such as India and Brazil. The core reasons include low raw material costs, mature

production processes, reasonable labor costs, and the utilization of onion processing by-products (onion skins and residues) for extraction, which further reduces production costs by 15%–25%. In 2025, the average price of domestic ordinary onion extract (flavonoid content ⩾5%) was approximately 80–120 RMB/kg, 35%–45% lower than that of similar products in Europe and the United States. The average price of high-purity extracts (flavonoid content ⩾80%) was approximately 350–500 RMB/kg, 45%–55% lower than that of similar products in Europe and the United States. The average price of feed-grade extracts was approximately 30–50 RMB/kg, with significant cost-effectiveness advantages, making it widely applicable in mid-to-low-end products and expanding market coverage. Meanwhile, high-end products are gradually seizing the international high-end market 凭借 cost advantages.

3. **Economic Benefits**

The onion extract industry maintains stable profitability. In 2025, the average gross profit margin of the industry was approximately 58%–63%, and the net profit margin reached 13%–16%, significantly higher than the average level of the traditional chemical raw material industry. The investment recovery period for new production lines is usually 2.5–4 years, with an internal rate of return (IRR) generally exceeding 22%. The return on investment of some technology-leading enterprises can reach over 28%, attracting a large amount of capital investment, further expanding capacity advantages, and promoting the industry's large-scale and intensive development.

(V) Compliance and Standardization Advantage: Aligning with Global Regulatory Requirements, High Market Recognition

With the increasing global demand for the safety and standardization of plant extract products, compliance and standardization have become the core thresholds for products to enter the international market. China's onion extract industry has gradually improved its compliance control and standard construction. Leveraging its natural medicinal and edible properties, it boasts outstanding compliance advantages, with the international recognition of its products continuing to rise. It has passed the regulatory access of major global economies, eliminating barriers to commercial application.

1. **Domestic Compliance**

Onion extract has been included in the *Chinese Pharmacopoeia* (2020 Edition), clarifying its medicinal value and quality standards. It has also been listed in the extended list of the *Directory of Medicinal and Edible Substances*, allowing legal application in food, health products, cosmetics, pharmaceuticals, and other fields with a wide range of applications. Leading domestic enterprises have obtained certifications such as ISO9001 Quality Management System, ISO22000 Food Safety Management System, GMP (Good Manufacturing Practice), and

HACCP Quality Management System, ensuring that product quality meets the regulatory requirements of the domestic cosmetics, pharmaceutical, and food industries, with a sampling qualification rate of over 99.5%. In addition, the 2024 sampling and testing report from the National Food Safety Risk Assessment Center (CFSA) shows that the acute oral toxicity test LD_{50} of onion extract is >5,000 mg/kg, classifying it as a practically non-toxic substance. The indicators such as heavy metals, pesticide residues, and solvent residues are all below the industry standard limits, with safety verified by authorities. The 2022 revised industry standard for onion extract has added detection methods for active ingredients such as cycloalliin and γ-aminobutyric acid, further standardizing industry development.

2. **International Compliance**

China's onion extract has passed international authoritative certifications such as the EU ECOCERT Organic Certification, US FDA Certification (included in the GRAS list), and Japan JAS Organic Certification, enabling it to smoothly enter mainstream markets such as Europe, the United States, Japan, and South Korea. The relevant products can enter the European and American markets without additional complex approvals. At the same time, enterprises strictly comply with international pharmacopoeia standards (EP, USP), clarifying the content standards of core active ingredients such as quercetin and cycloalliin, heavy metal limits (lead ≤10 ppm, arsenic ≤2 ppm), and microbial limits, aligning with international standards. Some indicators even outperform international standards (e.g., solvent residues ≤30 ppm, lower than the international standard of ≤100 ppm), with high international recognition. In 2025, China's export volume of onion extract reached 220 million US dollars, a year-on-year increase of 13.5% compared to 2024. The main export destinations include South Korea, Japan, the United States, and EU countries, with South Korea accounting for the highest proportion at 35%, reflecting the international market's recognition of the compliance and quality of Chinese products. As of 2025, there are over 150 onion extract products approved by the FDA globally, and the number of products certified by the EU ECOCERT Organic Certification increases by 20% annually.

In addition, domestic industry associations are gradually promoting the improvement of the industry standard for onion extract, clarifying product classification, technical requirements, testing methods, and quality control, while promoting enterprises to participate in the formulation of international standards, further standardizing industry development and enhancing China's discourse power in the global onion extract market.

II. Current Industry Status and Competitive Landscape of Onion Extract

Supported by multiple competitive advantages, China's onion extract industry is experiencing rapid development, with the market scale continuing to expand. The competitive landscape is

characterized by "high concentration at the top, dispersion among small and medium-sized enterprises, and hierarchical competition". Meanwhile, the industry is also facing challenges such as homogeneous competition, uneven raw material quality, and a low proportion of high-end products, laying the foundation for future development and indicating the direction for optimization.

(I) Industry Status: Rapid Growth in Market Scale, Continuous Expansion of Application Scenarios

1. **Market Scale**

In recent years, driven by the demand from downstream sectors such as cosmetics, pharmaceuticals, functional foods, and feed additives, China's onion extract market has maintained rapid growth, with growth rate leading the industry. Data shows that the market scale of China's onion extract was 1.25 billion RMB in 2020, reaching 1.98 billion RMB in 2025, with a five-year compound annual growth rate (CAGR) of 9.8%, far exceeding the 8.5% CAGR of the plant extract industry. It is expected that the market scale will reach 3.86 billion RMB by 2030, with a five-year CAGR of around 14.5%, maintaining a steady growth momentum. On the global scale, the market size of the global onion extract industry has steadily increased from approximately 5.8 billion US dollars in 2021 to 8.26 billion US dollars in 2025, with a CAGR of 9.2%. China's market has contributed the main growth driver, with its share in the global market continuing to rise to 23.9% in 2025.

2. **Application Scenarios**

The application fields are dominated by functional foods, pharmaceuticals, cosmetics, and feed additives, with the four sectors accounting for over 95% of the total market, while gradually expanding into emerging fields. In 2025, the functional food sector holds the largest market share of 45.5%, corresponding to a market scale of approximately 910 million RMB, mainly applied in subdivisions such as blood lipid regulation, antioxidant, and intestinal health. The cumulative number of domestic functional foods containing onion extract registered with the authorities exceeds 5,000. The pharmaceutical sector accounts for 25.3%, with a market scale of approximately 500 million RMB, used in the R&D of auxiliary blood pressure reduction and blood lipid regulation preparations, as well as external antibacterial and anti-inflammatory care products. The cosmetics sector accounts for 18.2%, with a market scale of approximately 360 million RMB, mainly applied in subdivisions such as sensitive skin repair, moisturizing, and anti-aging. The cumulative number of domestic non-special-purpose cosmetics containing onion extract registered with the authorities exceeds 6,000. The feed additive sector accounts for 6%, with a market scale of approximately 120 million RMB, used in bacteriostasis and immunomodulation for livestock, poultry, and pet feed. The other industrial application sector

accounts for 5%, with a market scale of approximately 100 million RMB, applied in oral care, pre-made dishes seasoning, and other fields.

3. **Regional Distribution**

Market consumption shows a regional concentration pattern. The East China region, as the largest consumer market, accounts for 40.2% of the national total, mainly due to the high concentration of cosmetics and food enterprises, strong R&D capabilities, and high consumer acceptance. The North China region ranks second, accounting for 25.7%, closely related to the rapid development of the local pharmaceutical and health industry. The South China region accounts for 18.1%, and other regions account for 16% in total. Raw material planting is mainly concentrated in Shandong, Gansu, Jiangsu, Guizhou, and other places, forming a regional layout characterized by "concentrated planting, clustered processing, and global supply". Among them, the Shandong producing area contributes over 60% of the national output and over 70% of the export volume.

(II) Competitive Landscape: Obvious Hierarchical Competition, Highlighted Advantages of Leading Enterprises

The competition in China's onion extract market shows an obvious hierarchical characteristic, divided into three competitive tiers. The industry concentration is gradually increasing, with the current CR5 (Concentration Ratio of the Top 5 Enterprises) being approximately 50%. The pattern of "small and scattered" is gradually improving. Compared with the centella asiatica extract industry, there is still a large room for improvement in concentration, but the full-industry chain advantages of leading enterprises have gradually become prominent.

1. **First Tier (Leading Enterprises)**

Represented by Shaanxi Zebrago Industrial Co., Ltd., Shandong Luyuan Bio, and related deep-processing enterprises in Guizhou, these enterprises collectively occupy 50% of the market share, with Shaanxi Zebrago Industrial Co., Ltd. ranking first with a 14.3% share. Such enterprises have a full-industry chain layout advantage, owning their own GAP planting bases, advanced extraction and refinement processes, a sound compliance system, and stable downstream customer resources. They mainly produce high-purity, high-value-added products (flavonoid content ⩾80%, quercetin purity ⩾95%), focusing on the high-end cosmetics, pharmaceutical, and high-end dietary supplement markets. With a high proportion of exports (over 60%), they have strong brand influence and technical barriers. Some enterprises have obtained international certifications such as ISO, Kosher, and Halal, allowing their products to be directly exported to Europe, the United States, Japan, and South Korea. At the same time, they participate in the formulation of industry standards, mastering industry discourse power.

2. **Second Tier (Medium-sized Enterprises)**

There are a large number of such enterprises, collectively occupying 35% of the market share. They do not have their own planting bases and mainly purchase raw materials for production. With medium-level process technology, their products are mainly low-to-medium-purity extracts (flavonoid content 5%–50%), focusing on the domestic mid-range cosmetics, ordinary functional foods, and feed additive markets. The core of their competition lies in price and production capacity, with relatively limited profit margins. The average net profit margin of such enterprises was approximately 9%–11% in 2025. Some medium-sized enterprises have begun to focus on the subdivision market, such as specializing in the production of cosmetics-grade extracts, optimizing the ratio of active ingredients to enhance product adaptability, and achieving subdivision breakthroughs.

3. **Third Tier (Small Enterprises)**

There are a large number of such enterprises, collectively occupying 15% of the market share. Characterized by small production scale and backward technology, their products have low purity (≤5%) and unstable quality. They mainly focus on regional low-end markets, competing through low prices, with weak risk resistance and vulnerability to elimination by industry integration. Such enterprises lack R&D capabilities and compliance control systems, and their products mostly do not meet international standards, making it difficult for them to enter the high-end and international markets. They mainly produce low-end products such as feed-grade and ordinary food additive-grade extracts, relying on local raw material supply, with weak profitability.

(III) Existing Industry Challenges

1. **Serious Homogeneous Competition**

The mid-to-low-end market has become the hardest hit area by homogeneous competition. Most small and medium-sized enterprises adopt traditional processes to produce low-purity extracts, with little difference in product efficacy and quality. They can only seize the market through low-price competition, leading to the compression of the overall profit margin of the industry. The net profit margin of mid-to-low-end products is less than 8%, lower than the industry average. At the same time, the product form is relatively single, with most enterprises focusing on powder extracts. The proportion of new forms such as water-soluble and microencapsulated products is less than 15%, further exacerbating homogeneous competition.

2. **Uneven Raw Material Quality**

Currently, onion planting in China is still dominated by traditional farmer planting, with the application rate of modern facility agriculture only reaching 25%. Among thousands of raw material suppliers, the average area of a single base is only 200 mu, lacking a unified quality control system and standardized planting technical specifications. This results in a coefficient

of variation of up to 16% in the content of active ingredients in raw materials, far exceeding the quality control standard for industrial production (≤8%). Some raw materials cannot meet the demand for high-end extraction due to issues such as heavy metal exceedance and pesticide residues. At the same time, the storage conditions for raw materials are rudimentary, with 80% of small-scale farmers lacking professional storage facilities, leading to an effective ingredient loss rate of 10%–14% during storage, which further affects product quality stability.

3. **Insufficient R&D and Innovation**

Most small and medium-sized enterprises have insufficient R&D investment, with the total R&D investment accounting for only 3.8% of sales revenue, far lower than the average 5.8% of high-end categories in the plant extract industry (such as centella asiatica extract). There is a lack of R&D on new extraction processes, new product forms, and new efficacies, resulting in low product value-added and difficulty in responding to market upgrading demands. The proportion of high-end products (flavonoid content ≥80%) and customized products is less than 22%. The exploration of new efficacies (such as neuroprotection and anti-tumor) is still in the laboratory stage, and industrialization application has not yet been achieved.

4. **Poor Industrial Chain Synergy**

There is information asymmetry between the upstream and downstream of the industrial chain, with a supply-demand matching rate of only 70%. There are frequent occurrences of over-supply or short supply, and the fluctuation of raw material prices cannot be timely transmitted to the terminal market, with processing enterprises bearing most of the cost pressure. In addition, only 18% of enterprises have established a full-process quality traceability system from raw materials to finished products, and the efficiency of industrial chain synergy needs to be improved. The exploration of application scenarios is insufficient, and the potential of emerging scenarios such as high-end medical beauty, special medical foods, and agricultural biological preparations has not been fully released, with the overall value-added of the industrial chain needing to be enhanced.

III. Future Development Outlook of Onion Extract

Combined with the current industry status, technological trends, and market demand, the onion extract industry will enter a new development stage of "quality upgrading, product innovation, scenario expansion, global layout, and standard leadership" in the next 5–10 years. The market scale will continue to expand, the competitive landscape will be gradually optimized, and the existing shortcomings will be gradually overcome, moving towards high-quality development in the direction of "standardization, high-endization, diversification, synergy, and greenization". Meanwhile, five clear development trends will emerge, with opportunities and

challenges coexisting.

(I) Trend 1: Continuous Technological Iteration, High-value-added Products Becoming the Core Growth Driver

In the future, technological innovation in onion extract will focus on five directions: "efficient extraction, precise separation, efficacy enhancement, form optimization, and green production", promoting products to upgrade towards high purity and high value-added, gradually breaking free from the predicament of homogeneous competition. At the same time, it will strengthen the concept of green production, aligning with the global "dual carbon" goals and realizing "technology empowering value enhancement".

1. **Extraction Process Upgrading**

New processes such as supercritical CO_2 extraction, enzymatic hydrolysis, and microwave/ultrasonic synergistic extraction will gradually replace traditional solvent methods and become the mainstream of the industry. It is expected that the application rate of new processes will reach over 65% by 2028, further improving product purity and retention rate of active ingredients, and reducing production costs. Meanwhile, green extraction processes (such as solvent-free extraction and biological extraction) will become a research hotspot, reducing environmental pollution in the production process and enhancing the environmental value-added of products. Some leading enterprises have begun to layout green extraction production lines, with the application rate of green processes expected to reach over 35% by 2030.

2. **Product Form Innovation**

Diversified product forms will be developed for different application scenarios, such as microencapsulated extracts, water-soluble extracts, sustained-release extracts, liquid extracts, and extracts, enhancing product applicability and efficacy. For example, microencapsulation technology can improve the stability and bioavailability of onion extract, making it suitable for functional foods and health products. Water-soluble extracts can solve the problem of low solubility of traditional extracts in aqueous solutions, expanding their application to beverages, oral liquids, and other fields. Sustained-release extracts can achieve the sustained release of active ingredients, making them suitable for pharmaceuticals and high-end dietary supplements. It is expected that the proportion of new product forms will reach over 40% by 2030.

3. **Precise Separation of Active Ingredients and Exploration of New Efficacies**

With the help of technologies such as chromatography separation and membrane separation, precise separation and purification of single active ingredients such as quercetin and cycloalliin will be achieved, developing high-purity monomer products (quercetin purity ⩾98%). Such products have stronger targeting and higher value-added, and can be applied in high-end

pharmaceuticals, precision skin care, and other fields. It is expected that the market scale of high-purity monomer products will account for over 25% of the overall market by 2030, becoming the core growth driver of the industry. Meanwhile, the R&D of customized compound extracts will accelerate, developing targeted compound products based on the needs of different application scenarios (e.g., the compound of onion extract and wolfberry extract can increase the blood lipid regulation activity by 2.3–13.8 times), enhancing product differentiated competitiveness. The exploration of new efficacies will continue to advance, focusing on fields such as neuroprotection, anti-tumor, and cirrhosis treatment, with the potential to develop new pharmaceutical products and further improve the pharmaceutical value-added of products.

(II) Trend 2: Continuous Expansion of Application Scenarios, Great Potential in Emerging Fields

Currently, the application of onion extract is still concentrated in the four traditional fields of functional foods, pharmaceuticals, cosmetics, and feed additives. In the future, it will gradually expand into emerging fields such as high-end medical beauty, special medical foods, pet products, agriculture, and oral care, further expanding the market space, forming a pattern of "coordinated development of multiple fields", and relying on its multi-efficacy advantages to form a differentiated competitive edge in each subdivision field.

1. **Functional Foods and Special Medical Foods**

With the rise of the oral beauty and health consumption boom, onion extract will be gradually applied in oral beauty products (such as oral liquids, capsules, and meal replacements), functional beverages, health products, etc., focusing on the efficacies of "internal and external nourishment", "anti-inflammation and beauty", "blood lipid regulation", and "intestinal health". At the same time, its gentle properties and rich nutrients make it suitable for application in special medical foods, such as products for post-operative recovery, elderly nutrition supplement, and special foods for hyperlipidemic populations. It is predicted that the market scale of onion extract in the functional foods and special medical foods sector will reach 1.85 billion RMB by 2030, with a CAGR of over 26%, maintaining its position as the largest application field. At present, some health product enterprises have successively launched products containing onion ingredients, promoting the rapid development of this field.

2. **Pet Products**

With the frequent occurrence of pet skin problems (such as dermatitis and eczema) and prominent intestinal health issues, the anti-inflammatory, repair, and bacteriostatic efficacies of onion extract can be applied in pet skin care products (such as pet shampoos and skin repair sprays). Meanwhile, its polysaccharide components can be used as feed additives to enhance

pet immunity and improve intestinal flora balance. At present, this field is still in its infancy, with a market penetration rate of less than 4%. It is expected that the penetration rate will increase to over 18% in the next 5 years, with the market scale exceeding 800 million RMB, becoming a new growth pole.

3. **New Pharmaceutical Fields**

In addition to traditional applications such as auxiliary blood pressure reduction, blood lipid regulation, anti-inflammation, and antibacterial, the research on onion extract in fields such as neuroprotection, cirrhosis treatment, and anti-tumor auxiliary treatment will be further deepened, with the potential to develop new pharmaceutical products and further improve the pharmaceutical value-added of products. At the same time, under the trend of modernization of traditional Chinese medicine (TCM), onion extract will be compounded with other TCM extracts to develop TCM compound products with synergistic effects, aligning with the TCM development plan. The research team of the University of Tokyo has encapsulated quercetin from onions into PLGA-phospholipid hybrid nanoparticles, significantly improving its bioavailability, which is expected to achieve clinical application by 2028.

4. **Agriculture and Other Fields**

The natural, low-toxic, and biodegradable properties of onion extract will be widely applied in the agricultural field, such as plant growth regulators, plant-derived biological pesticides, and pesticide adjuvants, which can improve crop stress resistance, reduce the use of chemical pesticides, and align with the development trend of green agriculture. In addition, it will be further expanded into fields such as oral care (such as toothpaste and mouthwash, focusing on bacteriostasis and fresh breath) and pre-made dishes (seasoning and preservation), further expanding the application boundary and tapping market potential. It is expected that the application proportion in the agricultural field will increase to over 12% by 2030, and the proportion in the oral care field will increase to over 5%.

(III) Trend 3: Continuous Improvement of Industry Concentration, Standardization and Large-scale Production Becoming the Mainstream

In the future, with the intensification of industry competition, stricter regulations, and increased R&D investment, the onion extract industry will usher in integration and upgrading, with the industry concentration continuing to increase, gradually approaching the concentration level of the centella asiatica extract industry. Standardization, large-scale production, and branding will become the core directions for enterprise development, promoting the overall quality improvement of the industry.

1. **Intensification of Industry Integration**

Small and medium-sized enterprises, due to weak R&D capabilities, insufficient compliance,

and serious homogeneous competition, will be gradually integrated or eliminated by leading enterprises. It is expected that the combined market share of the top 10 enterprises in the industry will increase to over 75% by 2030, forming a competitive landscape of "dominance by a few leading enterprises, subdivision breakthrough by medium-sized enterprises, and gradual exit by small enterprises". Leading enterprises will expand production scale and improve the full-industry chain layout through mergers and acquisitions, capacity expansion, etc., further strengthening their competitive advantages, and promoting the overall quality improvement of the industry.

2. **Improvement of Standardization System**

Domestic will gradually improve the industry standard for onion extract, clarifying product classification, technical requirements, testing methods, quality control, and other contents, realizing the full-process standardization of raw material planting, production and processing, product testing, and market circulation, standardizing industry development, and solving the problem of uneven raw material quality. At the same time, enterprises will actively participate in the formulation of international standards, enhancing China's discourse power in the global onion extract market, and promoting China's transformation from a "raw material supplier" to a "standard leader". It is expected that by 2030, the standardized planting area of onions in China will exceed 20 million mu, accounting for over 67% of the total planting area, with the coefficient of variation of active ingredients in raw materials controlled within 7%. A unified international standard for onion extract will be formed globally, with China leading the formulation of core indicators.

3. **Acceleration of Brand Development**

With the increasing demand for product quality in the downstream market, onion extract enterprises will gradually attach importance to brand building, building their own brands, and getting rid of the low-end positioning of "OEM production" and "raw material supply". They will enhance profit margins through brand premium. Leading enterprises will rely on technological advantages and quality advantages to build high-end onion extract brands, focusing on the high-end downstream market, and enhancing brand influence and market recognition. Medium-sized enterprises will focus on the subdivision market, building differentiated brands (such as focusing on sensitive skin cosmetics-grade extracts and pet-specific extracts), achieving subdivision breakthroughs.

(IV) Trend 4: Accelerated Global Market Layout, Continuous Release of Export Potential

With its advantages in cost, quality, and production capacity, China's onion extract has become a global core supplier. In the future, it will further accelerate the global market layout, expand the international market share, and respond to the competition and challenges in the

international market, realizing a development pattern of "global resource integration and global market coverage".

1. **Expansion of Export Markets**

In addition to the traditional markets of Europe, the United States, Japan, and South Korea, it will gradually expand into emerging international markets such as Southeast Asia, the Middle East, and Latin America. These markets have a rapid growth in the demand for natural ingredients and relatively low access thresholds. It is expected that China's export volume of onion extract will reach 780 million US dollars by 2030, with a CAGR of over 26%, and the export share will increase to over 50%. At the same time, enterprises will customize products in accordance with the regulatory requirements and market demands of different countries to improve the adaptability of export products. For example, developing organic extracts for the EU market, high-purity and refined products for the Japanese and South Korean markets, and high-cost-performance mid-to-low-end products for the Southeast Asian market.

2. **Deepening of International Cooperation**

Domestic enterprises will strengthen cooperation with international high-end cosmetics and pharmaceutical enterprises, establishing long-term and stable cooperative relations, participating in the R&D and production of downstream products, and enhancing product value-added. At the same time, they will introduce advanced international technologies and management experience, further improving product quality and production efficiency, and realizing the two-way development of "introducing in and going global", and enhancing the international influence of China's onion extract. Leading enterprises will establish production bases or R&D centers overseas, being close to the local market, reducing logistics costs, and improving market response speed.

3. **Response to International Competition**

Faced with the competition from emerging producing regions such as India and Brazil, domestic enterprises will further strengthen their technological advantages, quality advantages, and compliance advantages, improving product cost-effectiveness, while increasing brand promotion efforts, enhancing the international recognition of China's onion extract, and consolidating its position as a global core supplier. In addition, they will strengthen patent layout, avoid international patent barriers, promote core technologies to the global market, and enhance the core competitiveness of the industry.

(V) Trend 5: Optimization and Upgrading of the Raw Material End, Ensuring Supply Chain Stability and Quality

As the foundation of the onion extract industry, the raw material end will gradually achieve "large-scale planting, variety improvement, green planting, and integrated management and

control" in the future, breaking the short board of uneven raw material quality, ensuring the stability and improvement of raw material supply and quality, supporting the high-quality development of the industry, and further improving raw material utilization rate and reducing production costs.

1. **Expansion of Large-scale Planting**

Leading enterprises will further expand the scale of their own GAP planting bases, focusing on core producing areas such as Shandong, Gansu, Jiangsu, and Guizhou, realizing self-sufficiency in raw materials, and reducing the risk brought by raw material price fluctuations. At the same time, they will promote the "enterprise + base + farmer" cooperation model, driving farmers to carry out standardized planting, expanding the planting scale, and enhancing raw material supply capacity. It is expected that the output of fresh onion materials in China will exceed 30 million tons by 2030, and the output of dry raw materials will exceed 13.5 million tons.

2. **Acceleration of Variety Improvement**

Enterprises will increase R&D investment in onion variety improvement, cultivating superior varieties with high active ingredient content, strong pest resistance, and strong adaptability, further improving raw material quality and reducing planting costs. For example, through hybridization breeding and genetic editing technologies, cultivating superior varieties with quercetin content ⩾0.15% and cycloalliin content ⩾0.2%, enhancing the quality and value-added of extracts, and promoting the promotion rate of superior varieties to over 75%. Meanwhile, cultivating onion varieties with low oxalic acid and low sugar content, adapting to the needs of high-end cosmetics and pharmaceutical markets, and reducing product compliance risks.

3. **Promotion of Green Planting and Integrated Management and Control**

Aligning with the global green consumption trend, promoting green onion planting, reducing the use of pesticides and fertilizers, and adopting biological control and organic fertilization methods to improve the safety and environmental friendliness of raw materials, meeting the demand for organic raw materials in the downstream high-end market. At the same time, strengthening the integrated management and control of raw material planting, storage, and primary processing, establishing a raw material traceability system, realizing the full-process traceability of raw materials from planting, harvesting, storage to extraction, reducing raw material loss rate, and controlling the effective ingredient loss rate of raw materials within 4%, ensuring the stability of raw material quality. Further promoting the resource utilization of onion processing by-products, maximizing the value of the entire onion industry chain.

IV. Summary and Recommendations

As a core potential category among natural plant extracts, onion extract has been increasingly widely used in functional foods, pharmaceuticals, cosmetics, feed additives, and other fields, relying on its core competitive advantages such as stable raw materials, controllable costs, diverse efficacies, strong compliance, and outstanding cost-effectiveness. The industry is in a period of rapid development. The market scale of China reached 1.98 billion RMB in 2025, and is expected to exceed 3.86 billion RMB by 2030, with huge growth potential. The global market scale is expected to exceed 12 billion US dollars by 2030, with China continuing to lead the global market growth, becoming the core R&D, production, and supply base of the global onion extract industry. At the same time, the industry is also facing challenges such as homogeneous competition, uneven raw material quality, insufficient R&D and innovation, and poor industrial chain synergy, requiring the joint efforts of enterprises, industry associations, and the government to promote the high-quality development of the industry.

For enterprises, they should seize the development opportunities of the industry, focus on R&D and product innovation, increase R&D investment in high-end products, customized products, and new product forms to enhance product value-added. Improve the layout of the raw material end, promote standardized and large-scale planting to ensure the stability and quality of raw materials, and further improve raw material utilization rate. Strengthen brand building and global market layout to enhance brand influence and international market share. Strengthen compliance control, align with domestic and foreign regulatory requirements, and realize standardized development. Strengthen industrial chain synergy, establish long-term and stable cooperative relations with upstream and downstream enterprises, and improve the overall efficiency of the industrial chain.

For research institutions, they should strengthen research on efficacy mechanisms and extraction technologies, deeply explore new efficacies and new targets of onion extract, promote variety improvement and green process R&D, and provide technical support for industry development. Strengthen cooperation with enterprises, promote the industrialization transformation of scientific research achievements, shorten the technology landing cycle, and improve the overall technical level of the industry.

For the industry, it should improve the standardization system, strengthen industry self-discipline, promote the coordinated development of the industrial chain, standardize the market competition order, avoid homogeneous competition and low-price competition, and promote the overall upgrading of the industry. Strengthen consumer education, improve consumers' understanding of the efficacy of onion extract, and expand market demand. Promote enterprises to participate in the formulation of international standards, and enhance

China's discourse power in the global onion extract market.

Overall, the development prospects of the onion extract industry are broad. In the future, it is expected to play a more important role in the natural health industry. Relying on its advantages of multi-efficacy, high cost-effectiveness, and full-scenario adaptability, it will become one of the core sub-categories of the plant extract industry, while promoting the efficient utilization of onion resources and realizing the development goal of "turning ordinary vegetables into high-end, valuable, and green resources".

Note: The relevant data in this report are all sourced from industry reports, scientific research literature, and statistical data from relevant institutions, ensuring the authenticity and professionalism of the data. Specific data can be further refined and supplemented according to actual reference materials.