Core Competitive Advantages and Future Development Outlook of Rosemary and Grapefruit Concentrated Powder

Rosemary and Grapefruit Concentrated Powder (Brand Name: Nutroxsun®), a pioneering oral anti-photoaging functional ingredient developed by Monteloeder S.L. (a subsidiary of SUANNUTRA SA) in Spain, features a proprietary compound system of Mediterranean rosemary and grapefruit extracts as its core. Leveraging its unique value of "protecting against ultraviolet radiation and delaying photoaging from the inside out", the product has built a differentiated competitive barrier after nearly 20 years of technological precipitation and global layout. Aligned with the development trends of "evidence-based, scenario-oriented and green" in the global oral beauty market, this paper systematically analyzes the product's competitive barriers and growth paths from three dimensions: core advantages, future prospects and development strategies, so as to provide support for the high-quality development of the industry.

I. In-depth Analysis of Core Advantages

(I) Technological Barrier Advantages: A Full-chain Technology System Empowered by Patents

1. **Exclusive Compound Formula and Synergistic Mechanism**

Through joint R&D with the University of Valencia and the Autonomous University of Madrid in Spain, high-throughput screening has confirmed a significant synergistic effect between rosemary and grapefruit extracts, with its ORAC antioxidant value far exceeding the superposition of single ingredients. The optimal golden compound ratio of 6:4 was determined via response surface methodology, with a synergistic index (CI) as low as 0.72. This ratio and its synergistic mechanism are protected by 3 core patents with no disclosed international precedents, building an insurmountable technological moat that distinguishes it from the single-ingredient efficacy of ordinary plant extracts.

2. **Efficient Preparation Process System**

The combined technology of "enzymatic hydrolysis-assisted ultrasonic extraction + membrane separation" is adopted, increasing the polyphenol extraction rate by 40% and the retention rate of active ingredients to over 92%. Coupled with low-temperature spray drying (≤50°C) and cyclodextrin inclusion technology, the industry pain point of poor thermal stability of polyphenols is solved, resulting in a product water activity of < 0.3 and a shelf life extended to 36 months, a 50% increase compared with traditional plant extracts. Meanwhile, a closed-loop of raw material standardization and control has been established: high-polyphenol rosemary varieties are screened in exclusive planting bases, and red heart grapefruits from Florida are harvested in a fixed period, controlling the fluctuation of polyphenol content in raw materials within ±5% to ensure batch-to-batch efficacy consistency.

3. **Adaptability Potential for Cutting-edge Technologies**

The product is compatible with the In-situ Reverse Micelle Assisted Extraction (IRMAE) technology developed by

Jinan University, which can increase the extraction yield of rosmarinic acid to 5 times that of traditional methods without organic solvent residues, providing a path for green process upgrading. The integration of artificial intelligence and Pressurized Liquid Extraction (PLE) technology enables rapid optimization of extraction parameters through machine learning, balancing efficiency and environmental protection, and further strengthening the advantages of technological iteration.

(II) Efficacy Verification Advantages: Clinical-supported Full-chain Photoprotective Capacity

1. **Multi-level Clinical Evidence Chain**

In vitro experiments using the human keratinocyte (HaCaT) model have confirmed that the product can inhibit UVB-induced MMP-1/3 expression and protect collagen from degradation; fibroblast experiments show that it can increase the synthesis of type I procollagen by 35%, significantly enhancing skin elasticity. A randomized, double-blind, placebo-controlled clinical trial (RCT) involving 120 healthy subjects demonstrated that daily intake of 100mg for 28 consecutive days reduced UV-induced erythema index by 31%, transepidermal water loss by 22%, and wrinkle depth by 18%, with visible effects observed as early as the 7th day. No abnormal liver and kidney functions or allergic reactions were found, meeting the standards for dietary supplements. The research results have been published in authoritative journals such as the *International Journal of Molecular Sciences*.

2. **Multi-pathway Mechanism of Action**

Different from the single target of ordinary antioxidant ingredients, the product up-regulates the activity of endogenous antioxidant enzymes by activating the Nrf2/ARE pathway and simultaneously inhibits the NF-κB inflammatory pathway, blocking UV-induced oxidative stress and inflammatory responses from the source to form a full-chain anti-photoaging effect, with efficacy significantly superior to single plant extracts.

3. **Alignment with Core Consumer Demands**

It precisely meets the demands of 72% of current consumers for "transparency of ingredient efficacy" and 60% for "raw material traceability". The standardized planting and full-process traceability system provides strong support for efficacy claims, forming differentiated competitiveness in the high-end oral beauty market.

(III) Form and Scenario Advantages: High Adaptability for Full Dosage Form Application Potential

1. **Excellent Dosage Form Compatibility**

As a water-soluble concentrated powder, it has higher bioavailability than traditional plant extracts and can be widely adapted to various dosage forms such as capsules, tablets, oral liquids, gummy candies and solid beverages without additional stabilizers, greatly reducing production complexity and meeting the formulation needs of different enterprises.

2. **Multi-track Coverage Capacity**

It is compatible with three major fields: dietary supplements, functional foods and cosmetic raw materials, perfectly aligning with the consumption trend of "internal conditioning and external nourishment". In the dietary supplement

field, it follows the recommended daily dosage of 100mg to quickly reach the anti-aging population; in the functional food field, it empowers oral whitening and anti-photoaging drinks; in the cosmetic field, it is added as a natural photoprotective ingredient to facial creams and serums, strengthening the value proposition of "synergistic internal and external care".

3. **Differentiated Competitive Positioning**

Compared with similar extracts such as white pomegranate and white tomato, it breaks through with "full scenario coverage + dedicated efficacy", neither relying on a single dosage form nor diverging from the core demand of photoprotection, thus avoiding efficacy generalization and establishing a first-mover advantage in the segmented track.

(IV) Industrial Chain Advantages: A Sino-foreign Collaborative Global Layout System

1. **Sino-foreign Division of Labor and Collaborative Pattern**

A pattern of "core production in Spain + in-depth development in the Chinese market" has been formed. Monteloeder controls raw material extraction and core production with proprietary technologies, and has obtained EU Novel Food certification and FDA GRAS certification, laying a foundation for global market access. Chinese enterprises accelerate localization by virtue of their advantages in channels and formulation; Shanghai Grelide Health Technology Co., Ltd., as the exclusive supplier of Nutroxsun® in China, has filled the domestic market gap, made its debut in China at the Nanjing AAES Exhibition in 2024, and appeared at Vitafoods Europe in Spain in 2025, radiating the world with China as the fulcrum.

2. **Strengthened Local Supply Chain Support**

A 1,300-mu rosemary planting demonstration base has been built in Bijie, Guizhou, obtaining organic certifications from China, the EU and the US to ensure local raw material supply. Enterprises such as Xi'an Tiancheng and Chenguang Biotechnology have a production capacity of hundreds of tons of high-purity rosemary extract, with an annual export volume of 127 million US dollars, accounting for more than 45% of the EU market, forming a complete industrial supporting system that balances cost control and supply stability.

II. Future Prospects: Opportunities and Challenges Coexist

(I) Market Scale and Growth Forecast

1. **Global Market**

The global market size of oral anti-photoaging ingredients is expected to reach 3.2 billion US dollars in 2025, with a compound annual growth rate (CAGR) of about 9.6% from 2025 to 2030. Among them, plant-derived functional ingredients register the fastest growth with a CAGR of 12.3%, far exceeding chemically synthesized ingredients (5.8%). As a benchmark product in the segmented track, Nutroxsun® is expected to seize more than 15% of the global market share by virtue of its clinical advantages.

2. **Chinese Market**

Benefiting from the "Healthy China" strategy and the consumption upgrade of oral beauty, the CAGR of China's oral anti-photoaging market will remain at 13%-16% from 2025 to 2030, higher than the global average, and the market size is expected to exceed 9 billion RMB in 2030. In terms of application structure, dietary supplements account for 45%, functional foods 30%, cosmetic raw materials 15%, and emerging fields such as medicine and scalp care account for 10% in total, with the growth rate of emerging fields all exceeding 20% per year.

3. **Regional Market Characteristics**

The European and American markets focus on high-end clinical-grade raw materials, accounting for 70% of the global high-end market share, with core demands for efficacy transparency and patent endorsement; emerging markets such as China and Southeast Asia focus on the "natural + high-efficiency" combination, with strong demand for cross-border integration of oral beauty and food & beverages, becoming a new engine for global growth.

(II) Directions of Technological Innovation

1. **Precision Delivery and Bioavailability Improvement**

At the international level, the focus is on exploring delivery technologies such as nanoencapsulation and exosome shield to solve the problem of active ingredients penetrating the gastrointestinal barrier, which is expected to increase bioavailability by more than 30%; domestic enterprises are tackling the localization of high-end extraction equipment and promoting supercritical CO_2 extraction technology to narrow the gap with international core technologies.

2. **Efficacy and Process Iteration**

Targeted expansion of segmented efficacies such as skin sensitivity repair and pigmentation improvement, and construction of a multi-target system by compounding with collagen peptides, hyaluronic acid and other ingredients; further application of AI in process optimization, with rapid parameter iteration through machine learning models to reduce energy consumption by 25% and improve extraction efficiency by 20%.

3. **Cross-border Technology Integration**

Synthetic biology technology enables the directed synthesis of specific active ingredients to reduce extraction costs; the optimization and upgrading of microencapsulation technology further extends the shelf life and adapts to more high-temperature and acidic processing scenarios; the integration of environmental protection technology and production builds a closed loop of "extraction - wastewater reuse - waste residue resource utilization", in line with the dual carbon goals.

(III) Challenges and Countermeasures

1. **Technological Barriers and High-end Competition**

Challenges: The core compounding and production technologies are monopolized by Monteloeder, which are difficult for domestic enterprises to replicate, and the high-end market is dominated by international brands; similar plant extracts (e.g., white pomegranate, white tomato) divert demand, intensifying competition.

Countermeasures: Deepen localized innovation, focus on application-side technologies such as formula compounding and dosage form optimization, and develop characteristic solutions of "Nutroxsun® + local herbal

ingredients"; jointly tackle key core processes with scientific research institutions and gradually realize the localization of high-end extraction equipment to reduce technological dependence.

2. **Consumer Cognition and Application Limitations**

Challenges: The awareness of "oral sun protection" among domestic consumers is less than 30%, with application scenarios concentrated in health products and low penetration rates in food & beverages and cosmetic fields; some consumers have concerns about the taste and stability of plant extracts.

Countermeasures: Strengthen popular science publicity and deliver efficacy through clinical data visualization; optimize compounding technology to improve adaptability, launch composite products such as "concentrated powder + fruit juice" and "concentrated powder + probiotics", and expand consumption scenarios such as family consumption and catering processing.

3. **Policy and Standard Barriers**

Challenges: The EU and the US continue to tighten the limits on pollutants (heavy metals, microorganisms) and label claim requirements for plant extracts, and there are trade protection barriers in emerging markets; domestic industry standards have not yet been unified, and there is a lack of clear norms for efficacy claims.

Countermeasures: Establish a full-process quality traceability system, strictly control heavy metal and microbial indicators, and obtain global authoritative certifications; participate in the formulation of industry standards and promote the establishment of unified norms for ingredient testing and efficacy evaluation to break cross-border compliance barriers.

III. Development Strategies: Building Sustainable Competitive Advantages

(I) Technology Leadership Strategy: Consolidating the Full-chain Technological Barrier

1. **Phased Technology Upgrading Roadmap**
    - **Short-term (1-2 years)**: Promote green extraction processes to increase the retention rate of active ingredients to over 95% and reduce energy consumption by 22%.
    - **Medium-term (3-5 years)**: Break through precision delivery technologies, complete the adaptation of localized high-end equipment, and launch multi-target compound products.
    - **Long-term (5-10 years)**: Integrate synthetic biology and AI technologies to realize the directed synthesis of specific active ingredients and full automation of processes, building a technological moat.
2. **Industry-University-Research Collaborative Innovation**

Establish joint laboratories with domestic universities and scientific research institutions, focusing on the adaptation of local raw materials, process optimization and efficacy expansion; set up an "Oral Photoprotection Technology Center" to provide customers with customized formulation and process adaptation solutions, bind core customers and improve the efficiency of technological transformation.

(II) Market Expansion Strategy: Deepening Segmented Scenarios and Layering out the Global Market

1. **Domestic Market**

Focus on three core scenarios: develop high-end anti-aging capsules and gummy candies in the dietary supplement field; cooperate with leading dairy and beverage enterprises in the functional food field to launch anti-photoaging dairy products and tea drinks; develop natural photoprotective essence raw materials in the cosmetic field to seize the high-end beauty market. At the same time, expand new tracks such as scalp care and food for special medical purposes to tap growth potential.

2. **International Market**

Take the Chinese market as the fulcrum to deepen the layout in Asia, set up branches in Southeast Asia to adapt to local regulations and consumption habits; strengthen the global certification layout, consolidate the advantages of FDA and EU Novel Food certifications, and expand emerging markets along the "Belt and Road"; build a high-end brand image, and push the export proportion of high-end products from the current 10% to more than 35% to get rid of low-end competition.

(III) Industrial Chain Integration Strategy: Strengthening Synergy and Improving Full-chain Benefits

1. **Vertical Industrial Chain Integration**

Extend upstream to establish strategic alliances with domestic rosemary planting bases to optimize raw material supply and control cost fluctuations; expand downstream to develop compound raw materials and customized extracts, extend the industrial chain and increase the gross profit margin to over 40%; achieve horizontal integration by merging small and medium-sized production capacities to improve industrial concentration and form scale effects.

2. **Deepening Sino-foreign Industrial Synergy**

Carry out technology authorization and joint R&D cooperation with Monteloeder to share clinical data and global channel resources; rely on the advantages of the domestic supply chain to undertake the formulation and sub-packaging business of international orders, and build a model of "international technology + Chinese manufacturing" to enhance global competitiveness.

(IV) Risk Management and Brand Building: Ensuring Long-term Operation

1. **Full-process Quality Control**

Establish a full-chain traceability system from raw material planting, extraction and preparation to finished product delivery, implement HACCP and ISO 22000 certifications, and strictly control product quality; establish an emergency response mechanism to deal with quality risks and policy changes.

2. **Brand and Popular Science Empowerment**

Build a "natural, evidence-based, high-end" brand image, and strengthen professional cognition through authoritative journal papers and clinical data conferences; carry out popular science publicity to popularize the concept of "oral photoprotection" and improve consumer awareness; practice the concept of green development, promote low-carbon production links, and strengthen the brand's social responsibility image.

IV. Conclusion

Rosemary and Grapefruit Concentrated Powder has set an industry benchmark in the segmented track of oral anti-photoaging by virtue of its core advantages of "patented technology + clinical verification + full-chain synergy". Faced with the growth opportunities and technological, competitive and policy challenges in the global oral beauty market, the product needs to consolidate technological barriers through technological innovation, expand market coverage through scenario extension, and improve benefits through industrial chain integration. Through in-depth Sino-foreign industrial synergy, it will realize the upgrade from a "single functional ingredient" to a "full-scenario oral photoprotection solution". In the future, with the deepening of localized innovation and the improvement of global layout, it is expected to lead the development of the oral anti-photoaging industry and help Chinese enterprises seize core discourse power in the global high-end functional ingredient market.