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International Competitiveness of China's Floriculture Industry

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ABSTRACT

Currently, China's floriculture industry, leveraging its abundant natural resources and deep-rooted cultural heritage, continues to advance toward achieving "Ecological Wealth and a Beautiful China." This study quantifies the international competitiveness of China's floriculture industry by employing three key indicators: market share in the global flower trade (MS), trade competitiveness index (TC), and revealed comparative advantage index (RCA). A comprehensive international competitiveness index was constructed based on the entropy weighting method applied to these indicators from a global perspective. The findings indicate that while China's floriculture industry possesses significant growth potential, achieving high-quality and sustainable development remains a long-term challenge. The study proposes strategic recommendations to enhance China's position in the international flower market, including improving product quality, expanding cross-border e-commerce exports, strengthening cold-chain logistics capabilities, and fostering talent development in the floriculture sector.

Keywords: floriculture industry; international competitiveness; fact; solution; China.

1. INTRODUCTION

With the rapid expansion of the global floriculture industry, the scale of production, output volume, and international trade of flowers have consistently demonstrated strong growth momentum. Flowers have long been a key commodity and one of the most dynamic product categories in global trade[5]. In recent years, China's floriculture sector has witnessed remarkable growth. According to industry statistics, the annual growth rate of its total output value has reached 20%, significantly surpassing the global average. This trend positions China as an emerging powerhouse in the global floriculture market, offering vast development potential.

In March 2025, the China Flower Association released trade data for 2024, highlighting the sector's resilience amid economic pressures. According to customs statistics, China's flower

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exports reached a record high, totaling nearly US$480 million—an annual increase of 4.21%—while imports stood at US$271 million. The primary export categories remain potted plants and fresh-cut flowers, generating US$165 million and $106 million in export revenue, respectively, together accounting for over 60% of total flower exports. China's floral products are now distributed across 112 countries and regions, with the top 10 export destinations—Japan, Vietnam, the United States, South Korea, the Netherlands, Thailand, Hong Kong, Australia, Singapore, and Germany—representing nearly 82% of total export value[8].

As one of the world's most biologically diverse countries, China is often referred to as the "*Mother of World Gardens*" and the "*Global Floricultural Gene Bank*"[8]. Its vast and varied topography, coupled with a wide range of climatic conditions, has endowed the country with an exceptionally rich and diverse floral biodiversity. According to estimates, China is home to over 27,000 species of higher plants, many of which serve as foundational germplasm resources for the global floriculture industry. Numerous ornamental plant species, including camellias, peonies, and lotuses, originate from China, spanning 113 plant families, 523 genera, and between 10,000 to 20,000 species[2].

As an integral part of ecological conservation efforts, the floriculture industry is not only a key sector that integrates ecology, economy, and aesthetics but also plays a crucial role in enhancing environmental quality, optimizing agricultural land-use structures, driving urban and rural economic development, diversifying income sources for farmers, and fulfilling the cultural and aesthetic needs of society. This industry serves as a fundamental pillar in China's commitment to ecological civilization and contributes directly to the realization of a "Beautiful China" vision[3].

2. LITERATURE REVIEW

2.1. Current Status and Trends in the Development of China's Floriculture Industry

With rising consumer purchasing power, demand for floricultural products has steadily increased, prompting flower producers to expand cultivation areas and scale up production to meet market needs [3]. However, the increasing demand for land and labor in flower cultivation has exerted significant pressure on production costs. Historically, the 1973 energy crisis severely impacted floriculture producers in Northern Europe, leading to a structural shift in the global cut-flower supply chain. European markets began sourcing flowers from low-cost, resource-rich regions with favorable climatic conditions and lower labor and land costs, such as emerging flower-producing nations like Kenya and Ecuador. This transition not only lowered production costs but also stimulated economic growth in developing countries [9].

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2.2 Growth in Flower Import and Export Volumes

In 2021, China's floriculture sector covered 1.5941 million hectares, reflecting an 8.27% year-on-year increase in cultivation area. Sales revenue reached 216.065 billion yuan, marking a 6.93% annual growth, while total import-export trade volume rose to US$701 million.

Potted plants remain a dominant segment, with major varieties including Phalaenopsis orchids, Cymbidiums, Guzmania, Bromeliads, Calatheas, Narcissus, and succulents. In the fresh-cut flower market, key species include roses, carnations, lilies, lisianthus, gerbera daisies, hydrangeas, chrysanthemums, and snapdragons, with supplementary fillers like baby's breath and limonium also occupying a significant market share[1].

2.3 Specialization, Industrialization, and Modernization of Production

The market competitiveness of floricultural products is primarily determined by their quality and cost-efficiency. Due to the perishability and price volatility of flowers, production costs fluctuate significantly. While China's floriculture industry is still evolving, it has witnessed the establishment of large-scale production bases and an increasing number of specialized enterprises.

Globally, several countries have successfully developed highly specialized flower production systems—for instance, tulips, roses, and chrysanthemums in the Netherlands; chrysanthemums, lilies, and carnations in Japan; roses in Israel; carnations in Colombia; and tropical orchids in Thailand and Singapore. China is actively working toward establishing a competitive advantage in floriculture by embracing intensive cultivation, precision management, and large-scale production strategies.

The industrialization of flower production plays a crucial role in cost reduction, efficiency improvement, and quality enhancement. Specialization brings product differentiation, technological advancement, and easier standardization. With economic globalization and rapid technological progress, the floriculture industry is increasingly shifting toward automated and precision-driven production models[6].

China is making substantial investments in the commercialization of floriculture, incorporating smart greenhouse technology to regulate temperature, humidity, light, ventilation, irrigation, and fertilization through computerized systems. Large-scale automation enables real-time monitoring, data-driven decision-making, and predictive analytics, ensuring higher efficiency and sustainability in flower production.

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2.4 Innovation in Varieties, Quality Enhancement, and Sustainable Development

As consumer preferences evolve, floriculture enterprises must continuously develop new varieties and enhance product quality to meet market expectations. Advances in plant biotechnology, including somatic hybridization, genetic engineering, polyploid breeding, and radiation-induced mutation breeding, have accelerated the diversification of flower species. The rapid increase in new cultivars has reinforced China's position in the global floriculture market.

Scientific and technological progress is a key driver of the floriculture sector. As research in plant genetics and breeding technologies advances, the technological value of fresh-cut flowers will continue to rise. Aligning with international floricultural standards, China is developing high-quality raw materials for flower exports. However, the country's floriculture research capacity remains relatively underdeveloped, relying primarily on imported germplasm and domestic breeding programs.

Simultaneously, consumer demand for organic, eco-friendly, and sustainable floriculture products is growing, driving the global market toward green and environmentally responsible development. The industry is increasingly prioritizing low-carbon production models, biodegradable packaging, and eco-certification standards to align with sustainability goals.

2.5 Maturation of the Floriculture Sales and Distribution System

The floriculture industry, as a convergence of traditional agriculture and modern services, has emerged as a key economic growth driver. China has developed a comprehensive marketing and distribution network, incorporating:

- Flower distribution hubs
- Auction markets
- Wholesale trade centers
- Retail chains
- E-commerce platforms
- International express delivery

Additionally, strategic marketing initiatives, such as advertising, premium packaging, superior customer service, and participation in horticultural exhibitions, have enhanced brand visibility and market penetration.

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The Chinese government has introduced policy-driven development plans to modernize the floriculture logistics and distribution network, aiming to strengthen infrastructure for post-harvest preservation, cold-chain transportation, and quality control inspections. Both national and local governments are investing in the construction of cold-storage facilities, distribution centers, and quality testing laboratories to enhance the efficiency of flower transportation and market circulation. These measures ensure a seamless and resilient supply chain for China's floriculture industry.

3. METHOS

3.1 Analysis of the International Competitiveness of China's Floriculture Industry

To assess the global position of China's floriculture industry, this analysis employs three internationally recognized indicators:

- International Market Share (MS)
- Trade Competitiveness Index (TC)
- Revealed Comparative Advantage Index (RCA)

These indicators provide a quantitative evaluation of China's competitive standing relative to other major flower-exporting nations [4].

3.2. Selection of Indicators for Floriculture Industry Competitiveness

3.2.1 International Market Share (MS)

The **International Market Share (MS)** measures the proportion of a country's floriculture exports relative to total global exports of flower products. A higher market share reflects stronger international competitiveness, whereas a lower share indicates weaker market positioning. The MS calculation is expressed as:

$$MS_{ij}(\%) = \frac{X_{ij}}{X_{iw}} \times 100$$

Where:

- MS_{ij} represents the market share of product "j" in country "i"

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- X_{ij} denotes export value of product "j" in country "i"
- X_{iw} represents the total global export value of product "j"

The MS value ranges from 0 to 1, with higher values indicating greater global market penetration. If China's floriculture products capture a growing share of global trade, this suggests enhanced international competitiveness. Conversely, a declining market share signals a weaker competitive position.

Table 1. Market Share of Major Flower-Exporting Countries (2010–2021) [%]

Year	Netherlands	Colombia	Italy	Germany	Belgium	America	Canada	Spain	China
2010	46.78	6.96	4.86	4.73	4.73	2.32	1.65	1.54	1.15
2011	51.64	5.85	4.40	4.95	4.20	1.97	1.40	1.53	1.06
2012	50.22	6.17	4.27	4.75	4.19	1.93	1.43	1.64	1.24
2013	49.59	6.22	4.15	5.14	4.09	1.93	1.41	1.64	1.28
2014	49.77	6.29	4.00	5.05	4.07	1.91	1.51	1.87	1.86
2015	48.62	6.94	4.10	4.98	3.14	2.18	1.84	1.70	1.59
2016	48.58	6.77	4.27	5.20	3.08	2.18	1.87	1.85	1.69
2017	48.44	6.85	4.56	4.95	2.93	2.16	1.90	1.96	1.63
2018	48.13	6.62	4.68	5.08	3.16	2.06	1.90	2.18	1.70
2019	47.66	6.69	4.51	4.81	3.10	2.05	2.13	2.15	1.93
2020	48.80	6.38	4.77	4.79	2.83	1.91	2.22	2.25	2.11
2021	50.46	6.29	5.15	4.35	2.93	1.87	2.44	2.38	2.04

Source: Data compiled from the International Trade Database (www.trademap.org).

Table 1 illustrates the global market share distribution of the top nine flower-exporting countries between 2010 and 2021, reflecting each country's relative strength in the international floriculture industry. Key observations from the data includes:

- The Netherlands consistently dominates the global floriculture market, maintaining an average market share of approximately 49%, accounting for nearly half of global flower exports.
- Colombia, Italy, and Belgium exhibit stable export market shares, maintaining competitive positions over the period.
- China's market share has shown a gradual upward trend, reaching a peak of 2.11% in 2020, before slightly declining to 2.04% in 2021.

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This steady growth indicates China's increasing presence in the global flower trade, though it remains a relatively minor player compared to dominant exporters like the Netherlands and Colombia.

3.2.2 Trade Competitiveness Index (TC)

The **Trade Competitiveness Index (TC)** is a key indicator used to assess a country's relative trade strength in the global market. It helps determine whether a country holds a competitive advantage in international trade by analyzing the balance between exports and imports. This index serves as a measure of a nation's economic strength, foreign direct investment capacity, and international market presence.

The **TC index** is calculated as follows:

$$TC_{ij}(\%) = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \times 100$$

Where:

- TC_{ij} represents the trade competitiveness index for product "j" in country "i".
- X_{ij} and M_{ij} denote the export and import values of product "j" in country "i", respectively.
- X_{ij} - M_{ij} represents the net export value, indicating whether a country is a net exporter or importer.
- X_{ij} +M_{ij} represents the total trade volume of the product in that country.

Interpretation of TC Values

- The TC index ranges from -1 to +1:
    - A value approaching -1 indicates a high import dependency, meaning that the country imports more than it exports.
    - A value approaching +1 signifies strong export competitiveness, where exports significantly exceed imports.
    - A TC value close to 0 suggests a balanced trade structure.
- When comparing different periods and countries, adjustments should be made to account for inflation and other macroeconomic factors.

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Table 2. Trade Competitiveness Index (TC) of Major Flower-Exporting Countries (2010–2021)

Year	Netherlands	Colombia	Italy	Germany	Belgium	U.S.A	Canada	Spain	China
2010	0.71	0.96	0.08	-0.61	0.12	-0.61	-0.10	0.09	0.33
2011	0.72	0.96	0.09	-0.57	0.11	-0.62	-0.10	0.16	0.28
2012	0.71	0.95	0.13	-0.57	0.15	-0.65	-0.14	0.22	0.30
2013	0.69	0.96	0.15	-0.51	0.15	-0.64	-0.14	0.27	0.23
2014	0.68	0.96	0.14	-0.52	0.14	-0.65	-0.09	0.30	0.37
2015	0.62	0.96	0.13	-0.52	0.20	-0.66	-0.05	0.22	0.16
2016	0.62	0.95	0.17	-0.50	0.15	-0.67	-0.01	0.22	0.19
2017	0.62	0.95	0.19	-0.51	0.16	-0.67	-0.02	0.24	0.09
2018	0.62	0.95	0.26	-0.50	0.16	-0.68	0.00	0.28	0.13
2019	0.63	0.96	0.39	-0.50	0.12	-0.70	0.05	0.27	0.23
2020	0.62	0.95	0.27	-0.51	0.07	-0.71	0.10	0.33	0.32
2021	0.64	0.93	0.30	-0.54	0.11	-0.74	0.11	0.30	0.40

Source: Data compiled from the International Trade Database (www.trademap.org)

As shown in Table 2, China's floriculture industry exhibits relatively weak trade competitiveness compared to leading flower-exporting nations.

- Ecuador, the Netherlands, Kenya, and Colombia demonstrate strong export competitiveness, with TC values consistently above 0.90.
- In contrast, the United States, Germany, and Canada show negative TC values, indicating that they are net importers of flowers rather than exporters.
- China’s TC index fluctuates, reaching 0.40 in 2021, indicating moderate competitiveness but still lagging far behind the dominant players in the global market.

This significant gap highlights China’s emerging but still developing status in the floriculture trade and underscores the need for enhanced export strategies to strengthen international market penetration.

3.2.3 Revealed Comparative Advantage Index (RCA)

The **Revealed Comparative Advantage Index (RCA)** is a widely used metric for assessing a country’s trade specialization in a particular industry or product. It measures whether a country has a comparative advantage by comparing the share of a product’s exports in the country’s total

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exports to the global share of that product's exports[7]. This index provides insights into the contribution of a country's exports to its economic growth and its position in international trade.

The **RCA index** is calculated as follows:

$$RCA_{ia}(\%) = \frac{(X_{ia}/Y_j)}{(X_{wa}/Y_w)} \times 100$$

Where:

- RCA_{ia} represents the revealed comparative advantage of product "a" in country "i".
- X_{ia} / Y_j denotes the export share of product "a" in the total exports of country "i".
- X_{wa} / Y_w represents the global export share of product "a" in total world exports.

Interpretation of RCA Values

- RCA > 2.5 → Strong competitiveness in the international market.
- 0.8 < RCA ≤ 2.5 → Moderate competitiveness.
- 0 < RCA ≤ 0.8 → Weak competitiveness.

Table 3. Revealed Comparative Advantage Index (RCA) of Major Flower-Exporting Countries (2010–2021)

Year	Netherlands	Colombia	Italy	Germany	Belgium	U.S.A	Canada	Spain	China
2010	14.34	26.41	1.64	0.56	1.75	0.27	0.64	0.94	0.11
2011	16.45	18.63	1.52	0.6	1.59	0.24	0.56	0.93	0.10
2012	16.72	18.83	1.57	0.62	1.73	0.23	0.58	1.04	0.11
2013	16.26	19.95	1.51	0.67	1.65	0.23	0.58	0.99	0.11
2014	16.31	21.65	1.43	0.64	1.63	0.22	0.60	1.10	0.15
2015	17.18	31.92	1.47	0.62	1.30	0.24	0.73	1.01	0.11
2016	16.52	34.69	1.47	0.62	1.23	0.24	0.76	1.04	0.13
2017	16.11	31.86	1.58	0.60	1.20	0.25	0.79	1.10	0.13
2018	15.82	30.63	1.65	0.63	1.30	0.24	0.81	1.22	0.13
2019	15.49	31.77	1.57	0.61	1.30	0.23	0.90	1.20	0.15
2020	15.48	35.94	1.67	0.61	1.18	0.23	1.00	1.26	0.14
2021	16.03	34.40	1.85	0.59	1.18	0.24	1.07	1.34	0.13

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The competitiveness of China's flower industry is typically evaluated using both the Trade Competitiveness Index (TC) and the Revealed Comparative Advantage Index (RCA). While TC accounts for both exports and imports, RCA focuses solely on exports, making the two indices complementary in assessing China's overall international trade position.

As shown in Table 3, Colombia, the Netherlands, and Belgium have notable comparative advantages in the global flower trade, with RCA values well above 2.5. Conversely, countries like the United States, Germany, and Canada exhibit low RCA values, indicating weak competitiveness in flower exports.

China has consistently ranked last among major flower-exporting countries in terms of RCA, with values ranging between 0.10 and 0.15 over the years. This suggests that China's flower industry remains in a weak competitive position. However, the gradual increase in RCA values indicates potential for growth. To enhance its standing in the international market, China must address key structural challenges, improve production efficiency, and strengthen export strategies.

3.3 Construction of the International Competitiveness Index of the Flower Industry

Evaluating the international competitiveness of the flower industry requires consideration of multiple factors. Relying on a single metric may result in a narrow and incomplete assessment, as different indicators capture various dimensions of competitiveness. Therefore, a comprehensive evaluation framework should integrate multiple metrics while accounting for their interrelationships and mutual influences.

This study employs the entropy method to analyze the degree of dispersion of each indicator, allowing for the calculation of objective weights. The entropy method is particularly advantageous due to:

- Its ability to provide an objective weighting system based on data dispersion.
- Low data requirements, making it suitable for diverse datasets.
- A relatively straightforward calculation process, improving computational efficiency.

To construct a comprehensive international competitiveness index for the flower industry, this study synthesizes the Market Share (MS) Index, Revealed Comparative Advantage (RCA) Index, Trade Competitiveness (TC) Index, and Concentration Ratio (CR) Index. The resulting weighted composite index provides a holistic evaluation of the international competitiveness of flower trade across countries.

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3.3.1 Principle of the Entropy Method

The concept of entropy was originally introduced by physicist Rudolf Clausius in 1850 to describe the spatial distribution of energy. In the context of economic analysis, entropy serves as a measure of the variability and uncertainty within a system, reflecting the interaction intensity and scope of different factors.

The entropy method is based on the following principles:

- When the distribution of an indicator becomes more uniform, its entropy value increases, leading to a lower weight in the evaluation system.
- Conversely, when an indicator shows greater dispersion or uneven distribution, its entropy value decreases, and its weight increases.

By applying information entropy, the weights of various indicators are objectively determined, ensuring a robust and data-driven evaluation of China's flower industry competitiveness in the international market. As an objective evaluation method, the entropy method provides a scientifically sound basis for assessing the global standing and competitive potential of China's flower industry.

3.3.2 Entropy Method Calculation

The **first step** in applying the entropy method is data normalization (dimensionless processing). This ensures that variables with different units and magnitudes are comparable.

Given a dataset represented as an **m×n** matrix, where:

- **m** is the number of samples,
- **n** is the number of variables,
- x_{ij} is the value of the **jth** indicator for the **ith** sample,

The dimensionless transformation is performed to standardize all indicators.

$$A = \begin{pmatrix} x11 & \cdots & x1n \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{pmatrix} \quad (1)$$

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Since the measurement units and directional trends of various indicators differ, it is essential to standardize the data through dimensionless processing. The following formulas are applied separately for positive and negative indicators to ensure consistency. Here, y_{ij} represents the dimensionless transformed data:

$$y_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)},$$

$$y_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)} \quad (2)$$

The **second** step involves eliminating extreme values, where the **d** value in this study is **set to 1**:

$$z_{ij} = d + y_{it} \quad (3)$$

The **third** step is standardization processing:

$$R_{ij} = \frac{z_{ij}}{\sum_{i=1}^{m} z_{ij}} \quad (4)$$

The **fourth** step calculates the entropy value, ensuring it falls within the range $0 \leq e_j \leq 1$

$$e_j = \frac{1}{\ln m} \sum_{i=1}^{n} p_{ij} \ln(p_{ij}) \quad (5)$$

The fifth step determines the weight of each variable:

$$w_j = \frac{1 - e_j}{p - \sum_{i=1}^{n} e_j} \quad (6)$$

4. FINDINGS AND DISCUSSION

4.1 Analysis of the International Competitiveness of the Flower Industry

Table 4. Weights of the Competitiveness Index for the Flower Industry (2003–2021)

Index	Information entropy value	Information utility value	Weight coefficient/%
(MS)	0.869 6	0.130 4	48.71
(TC)	0.914 4	0.085 6	31.97
(RCA)	0.949 5	0.050 5	19.32

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Source: Data calculated using the entropy method in SPSSAU (www.SPSSAU.com).

Table 4 presents the weight coefficients of key competitiveness indicators for the flower industry across nine major flower-exporting countries from 2003 to 2021. Among these indicators, the Market Share (MS) index holds the highest weight coefficient at 48.71%, followed by the Trade Competitiveness (TC) index (31.97%) and the Revealed Comparative Advantage (RCA) index (19.32%).

The significant weight of the MS index suggests that it plays a crucial role in determining a country's overall international competitiveness in the flower industry. Furthermore, the wide variation in MS values across countries highlights the substantial disparities in competitive strength among flower-exporting nations.

China's flower industry exhibits low overall international competitiveness. Although the TC and RCA indices contribute to competitiveness assessments, their impact remains relatively limited compared to the MS index.

Table 5. International Competitiveness of the Flower Industry (2010–2021)

Year	Netherlands	Colombia	Italy	Germany	Belgium	U.S.A	Canada	Spain	China
2010	52.33	16.07	5.89	5.28	5.80	2.78	2.32	2.34	1.73
2011	57.88	12.47	5.39	5.52	5.22	2.42	2.05	2.34	1.63
2012	56.54	12.86	5.28	5.33	5.26	2.37	2.08	2.50	1.82
2013	55.76	13.27	5.15	5.75	5.13	2.37	2.06	2.49	1.85
2014	55.95	13.88	4.97	5.64	5.10	2.34	2.17	2.77	2.46
2015	55.05	17.81	5.08	5.57	4.08	2.62	2.55	2.55	2.14
2016	54.81	18.53	5.26	5.79	3.99	2.62	2.60	2.71	2.25
2017	54.54	17.70	5.59	5.53	3.83	2.60	2.64	2.84	2.18
2018	54.14	17.08	5.74	5.67	4.09	2.50	2.65	3.11	2.25
2019	53.56	17.51	5.57	5.40	4.03	2.48	2.91	3.07	2.51
2020	54.70	18.54	5.84	5.38	3.71	2.34	3.05	3.20	2.70
2021	56.55	17.95	6.29	4.92	3.82	2.29	3.29	3.35	2.64

Source: Data compiled by the author using weighted calculations based on the three key competitiveness indicators.

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As shown in Table 5, the Netherlands has consistently maintained its dominant position in the global flower industry from 2010 to 2021, ranking first in terms of international competitiveness. Colombia and Italy rank second and third, respectively, demonstrating stable competitive performance.

Overall, countries worldwide are making continuous efforts to enhance their flower industries. China's flower industry, although still relatively weak, has exhibited gradual growth in competitiveness, approaching the levels of the United States, Canada, and other mid-tier competitors. This upward trend signals potential for future development, provided that China overcomes structural challenges and strengthens its market position.

4.2 Export Countermeasures for the Global Flower Trade

4.2.1 Enhancing the Quality of Flower Products

Given the fragmented and small-scale nature of flower production areas across China and its provinces, it is essential to promote specialized and large-scale production by integrating individual growers and small and medium-sized enterprises (SMEs) into cooperative production models. Concurrently, technical guidance and training programs for production bases should be strengthened to elevate the professionalism of flower enterprises and enhance growers' technological awareness.

To improve yield and quality, increased investment in scientific research is necessary, ensuring the cultivation of high-quality flower varieties. Additionally, fostering strong flower brands will enhance China's competitiveness in the international market, allowing Chinese flower exports to compete with global leaders effectively.

4.2.2 Expanding Cross-Border E-Commerce

Compared to traditional international trade, cross-border e-commerce offers multiple advantages, including lower operational costs, simplified transaction processes, shorter supply chain cycles, diverse sales channels, and access to a broader customer base. By leveraging data analytics provided by third-party e-commerce platforms, flower companies can assess their operational performance and market demand more accurately, allowing them to make informed strategic decisions and optimize their sales approaches. By leveraging data analytics from third-party e-commerce platforms, flower companies can assess operational performance and market demand more accurately, allowing them to strategically position their products.

Additionally, integrating modern e-commerce models with the traditional flower industry through an "online + offline" (O2O) strategy can maximize business potential. Regional

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differentiated pricing strategies should also be employed based on the economic development levels of target markets to capture demand in developed countries, optimize pricing structures, and enhance profitability.

4.3. Strengthening Cold Chain Logistics and Transportation

To address the challenges of flower logistics and ensure product quality during transportation, companies must adopt internationally advanced fresh-cut flower preservation technologies. This includes optimizing packaging standards by using materials that provide thermal insulation, pressure resistance, lightweight design, and compact size to minimize damage during transport. Improving packaging efficiency can significantly reduce post-harvest losses and maintain the freshness of flowers over longer distances.

Additionally, enhancing cold chain logistics infrastructure is crucial. This involves improving pre-cooling systems at production sites and expanding refrigeration capabilities in sales regions to maintain optimal temperature and humidity conditions. Establishing regional distribution centers can further streamline the logistics process, enabling direct farm-to-consumer deliveries and reducing overall transportation costs and transit risks.

By implementing these measures, flower enterprises can extend the shelf life of their products and improve export efficiency, thereby increasing their competitiveness in international markets.

4.4 Strengthening Talent Development and Industry Expertise

A highly skilled workforce is essential for the sustainable development of the flower export industry. Enterprises should actively collaborate with universities and research institutions to develop specialized training programs focused on flower standardization technologies. Establishing industry-academic partnerships will facilitate knowledge exchange, ensuring that scientific research aligns with market needs and industry trends. Moreover, providing hands-on training through enterprise-sponsored internships can enhance students' practical skills, preparing them for the demands of the global flower trade sector.

In addition to corporate initiatives, government support should be intensified through policies that encourage universities to introduce flower export education programs. Dedicated funding initiatives can further improve training facilities and faculty expertise, fostering the development of a professional talent pool for the industry.

By investing in human capital and industry-specific education, China’s flower sector can accelerate innovation, enhance its global competitiveness, and secure long-term growth in international markets.

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5. CONCLUSION

China's flower industry must remain committed to an ecological and green development strategy while enhancing product quality, optimizing industrial structure, improving logistics systems, strengthening market mechanisms, and leveraging digital technologies. These efforts will contribute to the sustainable growth of China's flower trade in the global market.

This study examines the planting conditions and trade data of China's flower market, utilizing three key indicators—International Market Share (MS), Trade Competitiveness Index (TC), and Revealed Comparative Advantage Index (RCA)—to assess the international competitiveness of the industry. By applying the entropy method to determine their respective weights, a comprehensive competitiveness index has been constructed. The quantitative analysis reveals that China's flower industry remains at a competitive disadvantage on the global stage.

To address these challenges, the study proposes several strategic measures: enhancing the quality of flower exports and adopting innovative production techniques, promoting cross-border e-commerce to facilitate export expansion, strengthening cold chain logistics to reduce transportation costs and improve product preservation, and fostering collaboration between enterprises and universities to develop a skilled workforce. Additionally, policies to attract and cultivate industry talent should be actively pursued to support the sector's long-term growth and global competitiveness.

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