HortiS (2025) 42(3):116-125
http://doi.org/10.16882/HortiS.1840815

HORTICULTURAL STUDIES

RESEARCH PAPER

An Evaluation of Türkiye's Peach Production and Global Competitive Performance

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Article History
Received 10 October 2025
Accepted 10 December 2025
First Online 12 December 2025

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Keywords
Competitiveness
Data analyses
Export
Markets
Trade balance

Abstract

This study aimed to provide a comprehensive analysis of Türkiye's production, exports, and competitiveness in the global peach market between 2010 and 2023. Data from FAOSTAT and TURKSTAT (Turkish Statistical Institute) for the 2010-2023 period were used in the analysis. Self-sufficiency and foreign trade balance indicators, as well as competitive advantage indices developed by Balassa (RCA), Vollrath (RXA), and Laursen (RSCA), were used in the data analysis. The analysis indicated that Türkiye ranked among the world's top three peach producers and maintains a structural production surplus, with a self-sufficiency rate consistently exceeding 100%. This surplus was channelled to global markets, resulting in a more than fivefold increase in the country's export volume during the period under review, elevating Türkiye to the world's second-largest exporter. Across all competitiveness indices, Türkiye has moved from a modest level to a strong competitive advantage since 2017, and this structural transformation is enduring. Furthermore, it was determined that this process not only focused on increasing quantity but also pursued a value-oriented growth strategy, achieving an approximately 30% increase in export unit prices. Consequently, to sustain Türkiye's strong competitive position, it was recommended that brand- and quality-focused strategies be developed to bring unit export prices closer to those of its main competitors, particularly in high value-added markets. Furthermore, it was crucial to continue investing in agricultural research and development, and in modern technologies, to maintain the advantage.

1. Introduction

The agricultural sector was strategically important to countries' economic and sustainable development. Fruit growing, a key subsector within this industry, accounted for a growing share of global agricultural production. Peaches are fruits of high economic value and are consumed worldwide. However, peach-producing countries differed significantly in production methods, production capacity, marketing strategies, and export performance. This situation differentiated countries' competitiveness within the sector. With the development of international trade and the spread of free-market economies through globalisation, the importance of competitiveness in the foreign trade in agricultural products has increased further. Competitiveness is influenced by production efficiency, product quality, cost management, and export capacity. In this context, it was important to analyse the current status of peach production and international trade and to determine the comparative competitiveness among countries. Competitiveness analysis was widely used. Indeed, while similar studies exist in the literature, a detailed comparative advantage analysis, particularly in

Türkiye, is notably absent due to a lack of current data. This study aimed to fill this gap.

Therefore, it was important to document the current status of peach production and to assess and analyse Türkiye's external competitiveness and position in global trade. Studies of competitive analysis have been reported in the literature. Indeed, Gül and Akpınar (2006) examined developments in fruit production in Türkiye and worldwide from 1961 to 2004. Gül et al. (2016) examined the development of the cherry trade. Chen et al. (2017) studied the comparative advantage and export competitiveness of fruits in China. Ceylan et al. (2018) conducted a comparative advantage analysis of the Turkish grape and cherry export markets. Sibulali (2018) analysed the competitive performance of the subtropical fruit industry in South Africa. Aşık and Ellibeş (2020) conducted a competitive analysis of citrus exports between Türkiye and EU member states. Ramirez Padrón et al. (2020) examined the competitiveness indicators of strawberry exports in Mexico. Kadakoğlu et al. (2022) examined walnut production projections and competitiveness in Türkiye. Kadakoğlu and Karlı (2022) analysed the competitiveness of Türkiye's foreign trade in food legumes. Bayav and Şahin (2023) studied the global economic importance of quince, its current status and forecast, and performed a competitive analysis. Kadakoğlu et al. (2023) analysed Türkiye's global competitiveness in oilseeds. Kadakoğlu and Karlı (2023) determined Türkiye's global competitiveness in olive oil and developed recommendations to increase it. Ghani et al. (2023) analysed the export competitiveness of Indian bananas in the international market. Kadakoğlu et al. (2024) analysed the global competitiveness of Türkiye's sour cherry industry between the years 2010 and 2022. Kadakoğlu et al. (2025) analysed Türkiye's tomato exports between 2010 and 2024, and Kadakoğlu and Gül (2025) analysed the competitiveness of global lemon exports during the same period.

Economic studies on peaches have been reported in the literature. Uçar et al. (2021) determined the costs and profitability of peach production in Izmir. Engindeniz and Çukur (2003) conducted a technical and economic analysis of peach production in the Kemalpaşa district of Izmir Province. Vural and Çakan (2021) conducted an economic analysis of the Turkish peach market and marketing margins. Birinci and Er (2006) evaluated the economic and marketing aspects of organic and conventional peach production in the Karacabey district in Bursa Province. However, studies on the competitiveness of peach exports were limited. Duru et al. (2022) analysed Türkiye's foreign trade performance in stone fruit, demonstrating the country's export potential. Bashimov (2022) analysed the competitiveness of stone fruit exports in Uzbekistan. Bayav and Çetinbaş (2021) estimated and analysed the competitiveness of peach production in Türkiye from 2010 to 2019. Mohamed et al. (2016) analysed the competitiveness of Egyptian peach exports in the UK market. An updated study in the literature was needed. Therefore, this study aimed to examine various aspects of Türkiye's peach production and its competitiveness.

2. Material and Methods

2.1. Material

The main material for this study consisted of secondary data obtained from the World Trade Organisation (WTO, 2025), the Food and Agriculture Organisation of the United Nations (FAOSTAT, 2025), and the Turkish Statistical Institute (TURKSTAT, 2025). In addition to these data, we utilised results reported in scientific publications. The data used in the study covered the period 2010–2023.

2.2. Method

To determine the competitiveness of the peach sector in foreign trade, the Revealed Comparative Advantage Index (RCA) of Balassa (1965), the Relative Export Advantage Index (RXA) of Vollrath (1991), and the Revealed Symmetric Comparative Advantage Index (RSCA) of Laursen (2015) were used. The Revealed Comparative Advantage Index (RCA) formula developed by Balassa (1965) was as follows:

$$RCA_j^i = \frac{x_j^i / \sum x^i}{\sum x_j^w / \sum x^w}$$

RCA_j^i: The Revealed Comparative Advantage Index of country i for product j,

x_j^i: The export value of country i for product j,

$\sum x^i$: The total export value of country i,

$\sum x_j^w$: The total export value of product j worldwide,

$\sum x^w$: The total export value of product j worldwide.

This index is designed to reveal a country's international competitiveness and level of specialisation in a specific commodity or sector, based on realised trade data. The index compared a country's export share of a specific product to its share of total global exports. This method has been widely used to determine the sectors in which countries have potential export advantages. RCA values between 0 and 1 indicate that countries do not have a comparative advantage; values between 1 and 2 indicate a weak comparative advantage; values between 2 and 4 indicate a moderate comparative advantage; and values above 4

indicate a high comparative advantage (Hinloopen and Marrewijk, 2001).

The formula for the Index of Relative Export Advantage (RXA), developed by Vollrath (1991), was as follows:

$$RXA_j^i = \frac{x_j^i / \sum x^i}{\sum x_j^w / \sum x^w}$$

RXA_j^i: Relative Export Advantage Index of country i in product j,

x_j^i: Country i's export value of product j,

$\sum x^i$: Country i's total export value,

$\sum x_j^w$: Country i's export value of product j minus the total export value of product j worldwide,

$\sum x^w$: Country i's total export value minus the total export value of product j worldwide.

This index was developed to correct a potential bias in Balassa's RCA index. The key difference was that the country's export figures were excluded from the global aggregate data used for comparison. This measure aimed to prevent a country with a large share of world trade from influencing the index results because of its size. This method allowed a country's competitive advantage to be measured not against itself but against the rest of the world. If the RXA value is greater than 1, it indicates that countries have a competitive advantage in the relevant product. If it is less than 1, it indicates that countries have a competitive disadvantage in the relevant product (Frohberg and Hartmann, 1997). The formula for the Revealed Symmetric Comparative Advantage Index (RSCA), developed by Laursen (2015), is as follows:

$$RSCA_j^i = \frac{(RCA - 1)}{(RCA + 1)}$$

$RSCA_j^i$: Country i's Revealed Symmetric Comparative Advantage Index for product j.

RCA represents the revealed comparative advantage index for each country for the relevant product. The RSCA value ranges from -1 to 1. A positive result indicates that a country has a competitive advantage for the relevant product; a negative result indicates a competitive disadvantage (Laursen, 2015).

Other ratios and coefficients used in the study are Net Export Rate (NER) and Export/Import Ratio. Net Export Rate (NER)is a indicator measuring the difference between exports and imports (Demir, 2001). It was calculated as follows.

$$NER\ (\% = \left[\frac{(Export\ value - Import\ value)}{(Export\ value + Import\ value)}\right] \times 100$$

Export/Import Ratio is the indicator that evaluates the trade balance by showing the ratio of exports to imports (Belicka and Saleh, 2011). It was calculated as follows.

$$\frac{Export}{Import} Ratio = \left(\frac{Export\ value}{Import\ value}\right) \times 100$$

3. Results and Discussion

Based on 2023 global peach production data, China accounted for 56.63% of the world's peach cultivated area and 64.63% of global peach production quantity, ranking first in both. Spain ranked second, accounting for 4.41% of the world's cultivated area and 5.10% of its production. Türkiye ranked third with a 3.58% share of this peach cultivated area and a 3.98% share of its production quantity. Therefore, Türkiye held a significant position in peach production. Within this overall picture, Türkiye's performance was particularly noteworthy across all indicators. While Türkiye holds a 3.98% share of global production, its 3.58% share of global cultivated area is considered direct evidence of efficient use of its agricultural land. Türkiye's yield, recorded at 19,254.30 kg ha^{-1}, underpins this success. This rate is approximately 11% higher than the global average of 17,339.40 kg ha^{-1} and compares favorably with the productivity level of Spain, Europe's leading producer (20,043.20 kg ha^{-1}). This success, demonstrated by Türkiye and based on high productivity, is even more significant compared with other countries on the list because some, such as Mexico, are unable to fully realise their production potential due to low productivity (7,992.30 kg ha^{-1}; Table 1).

Based on 2010 data, global peach exports were projected to increase by 6% by 2023. This increase was 445%, 41%, and 7% in Türkiye, Chile, and Spain, respectively. Spain accounted for 35.20% of global peach export volumes in 2023, Türkiye for 12.64%, and Chile for 7.28%. These data reflect global peach export market shares; in particular, Türkiye's position in this market has shifted significantly between 2010 and 2023. The 5.45-fold increase in Türkiye's exports corresponds to a 445% increase relative to the initial value. That this growth was achieved in a largely stagnant environment, with the global market growing by only 6% and the market leader, Spain, by only 7%, further underscores the significance of Türkiye's performance. A year-by-year analysis reveals that the increase in Türkiye's exports was not a sudden surge; rather, it represented a steady, sustainable, and dynamic upward trend, increasing from 41,392 tonnes to 225,470 tonnes. As a result of this superior performance, Türkiye's share of the global export market has undergone a substantial change. From a modest 2.5% market share in 2010, Türkiye

Table 1. Peach production areas, production quantities and yields in the world in 2023 (FAOSTAT, 2025).

Countries	Area harvested (ha)	Rate (%)	Production quantity (tonnes)	Rate (%)	Yield (kg ha^{-1})
China	884,372	56.63	17,500,000	64.63	19,788.10
Spain	68,940	4.41	1,381,780	5.10	20,043.20
Türkiye	55,928	3.58	1,076,852	3.98	19,254.30
Italy	54,350	3.48	1,033,840	3.82	19,021.90
USA	36,301	2.32	665,910	2.46	18,344.10
Iran	31,466	2.01	613,930	2.27	19,510.70
Greece	37,040	2.37	574,780	2.12	15,517.80
Chile	13,695	0.88	304,036	1.12	22,200.50
Mexico	32,253	2.07	257,774	0.95	7,992.30
Egypt	14,509	0.93	248,725	0.92	17,143.30
Other countries	332,787	21.31	3,420,246	12.63	9,664.20
World	1,561,641	100.00	27,077,873	100.00	17,339.40

Table 2. Leading countries in world peach export (tons) volumes (FAOSTAT, 2025).

Years	Spain	Türkiye	Chile	World
2010	585,292	41,392	91,916	1,681,054
2011	657,976	32,857	99,945	1,753,481
2012	647,501	43,540	94,335	1,881,526
2013	749,817	34,147	87,715	1,883,898
2014	842,656	39,389	48,274	2,006,280
2015	851,713	50,490	82,107	2,245,015
2016	822,647	50,638	91,964	2,147,762
2017	934,583	88,789	82,963	2,361,965
2018	744,093	126,732	96,250	1,959,588
2019	832,664	105,312	97,361	2,072,734
2020	656,584	163,267	101,587	1,906,301
2021	643,590	170,133	96,505	1,801,626
2022	540,156	204,063	111,165	1,773,228
2023	628,152	225,470	129,970	1,784,327
2010=100	107	545	141	106
2023 (%)	35.20	12.64	7.28	100.00

became a major supplier, accounting for 12.64% of the market by 2023 (Table 2).

The increase in export values was even greater than the increase in export volume. Global peach export values increased by 20.01% compared with 2010 levels. Türkiye saw a 7.01-fold change, Chile a 1.84-fold change, and Spain a 1.18-fold change. Spain accounted for 39.23% of the global export value in 2023. Chile accounted for 6.15% of global peach exports, while Türkiye ranked third, accounting for 1.36%. An in-depth analysis of these data reveals the extent to which Türkiye's role in the global peach market has transformed, not only in quantity but also in value. It was calculated that Türkiye's export value increased 7.01-fold, corresponding to a 600.88% increase. This growth rate was found to exceed the growth rates of the global market (20.01%) and its closest runner-up, Chile (83.63%), positioning Türkiye as the most dynamic and fastest-growing player in the market. More importantly, this increase in value was attributed not only to increased volumes of products sold, but also to a strategic shift that increased Türkiye's per-unit value. Türkiye's export revenue per ton increased from approximately US$697 in 2010 to US$897 in 2023. This was interpreted as evidence that Türkiye is not only a high-volume supplier but is also making significant progress in exporting higher-value products through improvements in product quality, branding, and market positioning. Consequently, it was demonstrated that Türkiye experienced exponential increases in both its export volume and the value derived from exports between 2010 and 2023, positioning itself as a strategic force focused on efficiency and value in the global market (Table 3).

According to 2010 data, global peach imports increased by 8.85%. Russia, Germany, and France were major importers of peaches. Relative to 2010, Russia's peach imports increased by 36.42% by 2023, whereas France's increased by 15.41%. Germany's peach imports decreased by 13.92% compared to 2010. Analysing the changes in these import markets from the perspective of the global strategy of a major exporting country, such as Türkiye, allows important inferences. In particular, Russia—with a strong 36.42% increase that made it the largest and fastest-growing import market, raising imports to 307,843 tonnes—has been assessed as one of the main demand centres driving the record-breaking export growth reported in previous analyses. Despite a contraction in the German market, Germany (237,052 tonnes) and France (133,679 tonnes) remained among Europe's largest and most stable buyers. This was considered indicative of Türkiye's successful penetration into both growing markets and traditional, large-volume European markets, where quality and standards are paramount. Consequently, demand dynamics in these major

Table 3. Leading countries in world peach export values (1000 US$, FAOSTAT, 2025).

Years	Spain	Chile	Türkiye	World
2010	834,650	130,901	28,852	2,127,382
2011	793,090	130,033	21,668	2,012,010
2012	833,421	129,862	28,053	2,344,349
2013	1,010,852	122,922	27,796	2,538,127
2014	965,919	105,668	34,937	2,292,307
2015	897,735	108,435	38,924	2,202,488
2016	879,057	126,997	25,700	2,157,198
2017	902,746	109,550	69,771	2,249,663
2018	938,280	137,488	87,105	2,257,408
2019	857,286	142,030	89,774	2,225,650
2020	971,972	136,719	152,105	2,425,858
2021	1,052,179	137,228	168,996	2,561,605
2022	917,679	126,324	199,353	2,456,194
2023	987,125	240,371	202,217	2,553,082
2010=100	118.27	183.63	700.88	120.01
2023 (%)	39.23	6.15	1.36	100.00

Table 4. Leading countries in world peach import volume (tonnes, FAOSTAT, 2025).

Years	Germany	Russian Federation	France	World
2010	275,400	225,653	115,827	1,629,663
2011	271,080	250,926	115,641	1,697,449
2012	279,192	266,220	129,113	1,832,217
2013	287,606	230,538	147,837	1,785,791
2014	286,194	225,400	147,426	1,929,938
2015	303,250	199,730	164,773	2,206,574
2016	292,502	194,302	170,721	2,073,598
2017	321,007	249,515	173,829	2,319,402
2018	274,554	227,463	157,278	1,991,404
2019	300,812	194,028	156,714	2,036,189
2020	235,239	240,229	134,755	1,812,185
2021	214,107	224,797	136,782	1,692,709
2022	219,145	308,716	113,733	1,673,980
2023	237,052	307,843	133,679	1,773,848
2010=100	86.08	136.42	115.41	108.85
2023 (%)	13.36	17.35	7.54	100.00

importing countries are both a cause and a consequence of Türkiye's exceptional peach export performance over the past decade. Türkiye has become a global player by strategically directing its growing production and export capacity to target markets (Table 4).

Based on data from 2010, global peach imports are expected to increase by 28.69% by 2023. Germany, Russia, and France saw increases of 9.63%, 39.67%, and 10.31%, respectively. Germany accounted for 15.32%, Russia for 12.23%, and France for 7.45% of the total global value of peach imports. These value-based import data were interpreted as significant indicators of the success of the market strategies of an export-oriented country such as Türkiye. The dynamics observed in the German market were particularly noteworthy; despite a decrease in imported peach volume compared to the previous analysis, the 9.63% increase in import value demonstrated a market trend toward "premiumization," indicating a demand for fewer, higher-value products. This situation presented a compelling strategic opportunity for Türkiye, which had previously demonstrated a significant increase in unit export prices. Similarly, the 39.67% increase in Russia's import value reaffirmed Russia as a significant and growing target market for Türkiye's expanding export volume and value. As a result, it became clear that the main markets in Europe and Russia not only demanded more peaches but were also willing to pay higher prices for them. It was concluded that this shift in global demand structure demonstrated the accuracy and timeliness of Türkiye's export-focused growth model, which over the past decade has increased both export volume and per-unit revenue (Table 5).

Türkiye, whose peach exports exceed imports, had an average net export ratio of 99.64, while Spain and Chile had 95.87 and 99.82, respectively. These countries had high net export ratios. This indicated their strong production capacity and competitive advantage in foreign markets. In terms of export-to-import ratios, Türkiye (55,739.22), Spain (12,713.88), and Chile (47,845.89) had exports that were significantly higher than their imports. These countries were running foreign trade surpluses. Maintaining the export-to-domestic consumption ratio was essential to preserve the domestic balance. A comparative analysis of these indicators reveals the extent of Türkiye's structural competitive advantage relative to its competitors. Türkiye's consistent Net Export Ratio performance, exceeding 99% over the five-year period, confirmed

Table 5. Leading countries in world peach import values (1000 US$, FAOSTAT, 2025).

Years	Germany	Russian Federation	France	World
2010	386,357	242,094	186,761	2,147,936
2011	342,929	361,191	155,232	2,196,756
2012	379,984	375,404	184,318	2,423,079
2013	453,321	318,511	242,209	2,604,241
2014	357,358	295,678	196,673	2,426,060
2015	351,298	118,088	202,661	2,382,238
2016	361,309	118,199	218,629	2,284,971
2017	367,434	212,060	201,970	2,501,780
2018	406,038	208,098	219,787	2,556,229
2019	351,319	214,028	179,093	2,413,217
2020	415,043	272,568	205,874	2,616,617
2021	405,250	282,661	227,381	2,704,745
2022	406,019	379,170	200,775	2,673,963
2023	423,581	338,139	206,022	2,764,134
2010=100	109.63	139.67	110.31	128.69
2023 (%)	15.32	12.23	7.45	100.00

Table 6. Other indicators of the competitiveness of the countries that are Türkiye's rivals in peach exports.

Countries	Indicators	2019	2020	2021	2022	2023	Mean
Türkiye	Net Export Ratio	99.27	99.76	99.60	99.85	99.69	99.64
	Export/Import Ratio	23,939.73	67,303.10	40,046.45	97,722.06	49,684.77	55,739.22
Spain	Net Export Ratio	96.97	97.55	97.03	91.07	96.75	95.87
	Export/Import Ratio	13,878.68	18,818.43	13,687.77	4,673.45	12,511.09	12,713.88
Chile	Net Export Ratio	99.69	99.93	99.66	99.91	99.93	99.82
	Export/Import Ratio	17,070.91	62,145.00	15,401.57	40,102.86	104,509.13	47,845.89

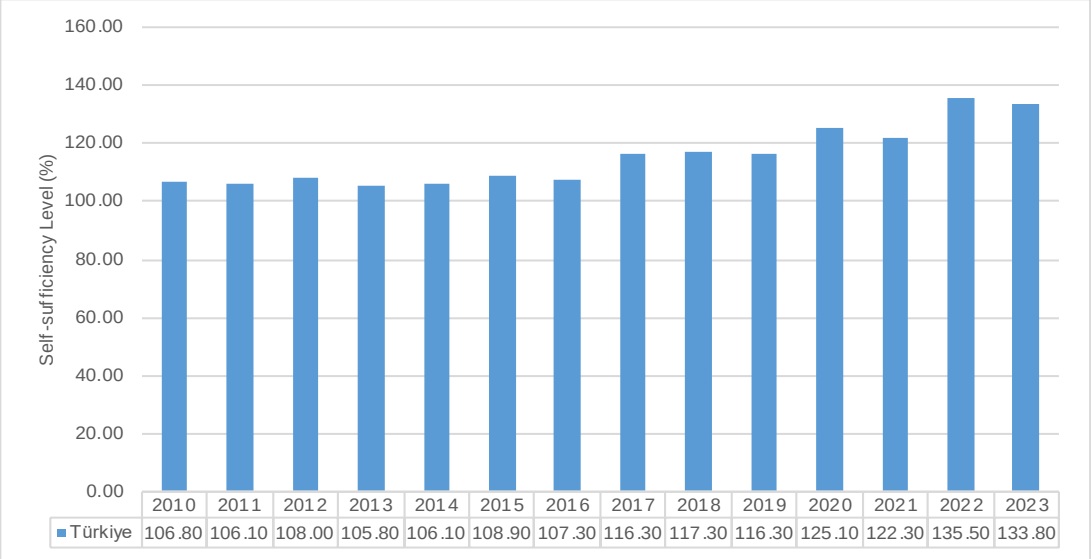

Figure 1. Türkiye's self-sufficiency level in peaches.

that the country had a virtually self-sufficient, export-oriented production structure, effectively independent of imports in this sector. However, the primary determinant of competitiveness was the export-import ratio. Türkiye, with an average ratio of 55,739.22, had the highest value for this metric, surpassing its closest competitors Chile and Spain. This ratio indicated that Türkiye exported approximately 55,739 units for every unit imported in the peach trade, demonstrating its overwhelming capacity to generate a foreign trade surplus and its status as the dominant exporter in the sector. Consequently, it was concluded that Türkiye's market rise, evidenced by increases in volume and value in previous analyses, is attributable to a structural competitive advantage. Türkiye is not only a major player in the sectorbut also the most efficient and dominant country in terms of trade balance (Table 6).

Türkiye's self-sufficiency level in peach production is shown in Figure 1. Between 2010 and 2023, the self-sufficiency ratio consistently exceeded 100%, indicating that Türkiye was producing more peaches than it needed (TURKSTAT, 2025). Türkiye possessed a production capacity that not only met domestic demand but also allowed for the export of the surplus. This position demonstrates strong agricultural infrastructure, a suitable climate, and efficient production techniques for peaches. The

Table 7. Balassa's revealed comparative advantage index (RCA) for peaches.

Years	Spain	Chile	Türkiye	USA	China	Italy	Greece	Jordan	Uzbekistan	France
2010	23.60	13.24	1.82	0.96	0.06	6.37	25.55	3.71	12.01	1.33
2011	23.58	14.55	1.46	0.98	0.15	5.61	23.25	6.01	26.58	1.33
2012	22.29	13.18	1.45	0.94	0.18	5.86	29.70	95.73	16.84	1.37
2013	23.76	11.96	1.29	0.85	0.15	5.24	22.86	90.55	9.71	1.30
2014	24.69	11.68	1.74	0.98	0.29	3.75	26.19	62.10	18.88	1.11
2015	23.92	13.15	1.94	0.77	0.44	3.81	21.26	112.92	9.10	1.14
2016	22.55	15.56	1.28	0.76	0.43	3.62	24.71	84.62	20.90	1.05
2017	22.28	12.55	3.34	0.65	0.54	3.00	21.34	84.78	18.83	1.02
2018	23.43	15.91	4.26	0.70	0.43	3.06	21.51	59.23	33.38	0.74
2019	21.92	17.63	4.24	0.68	0.83	2.36	19.52	56.90	26.34	0.68
2020	22.93	13.44	6.52	0.63	0.51	1.80	23.90	50.44	36.03	0.75
2021	24.10	12.62	6.53	0.80	0.31	2.27	10.47	119.93	27.11	0.79
2022	22.40	13.00	7.95	0.73	0.38	3.20	17.68	37.51	45.19	1.06
2023	21.86	23.78	7.40	0.68	0.36	1.76	17.17	67.27	34.89	0.95
Mean	23.09	14.45	3.66	0.79	0.36	3.69	21.79	66.55	23.98	1.04

production surplus shown in Figure 1, with a significant upward trend, especially since 2016, is considered a natural consequence of Türkiye's large-scale and efficient production capacity, which ranks third in the world. This increased domestic supply has been identified as the primary driver of Türkiye's record growth in export markets, as this excess capacity has significantly boosted both export volume and export value.

The competitiveness of leading peach-exporting countries worldwide was analysed using Balassa's Revealed Comparative Advantage (RCA) index. According to the the analysis, Türkiye exhibited a weak comparative advantage from 2010 to 2016, moderate in 2017, and high from 2018 to 2023. The sharp and sustained increase in Türkiye's index values since 2017 is considered a structural break, indicating that the country has transformed the strong production foundation and domestic supply surplus that it established in previous years into a global export specialist. The mean RCA for the period 2010–2023 was 3.66, indicating that Türkiye had a moderate comparative advantage. However, the high index value calculated over the last six years indicates that its competitiveness will increase in the coming years. Türkiye has a comparative advantage over China, the US, and France. The countries with a higher comparative advantage than Türkiye were Italy, Chile, Greece, Spain, Uzbekistan, and Jordan (Table 7). Bayav and Çetinbaş (2021) determined the average RCA value of peach exports between 2010 and 2019 to be 2.36. However, the findings of this study showed that the RCA value was 3.66 for the period 2010–2023. Since the study conducted in 2021, the competitiveness of peach exports has increased by 55.08% over the subsequent four years. This difference was attributed to the fact that Bayav and Çetinbaş's (2021) study covered the transition period (2010-2019), when Türkiye began to gain competitiveness, while the current study included the period 2020-2023, when competitive advantage reached its peak. This difference in findings between the two studies theoretically demonstrated that Türkiye's competitive advantage in peach exports was not a cyclical leap, but rather a structural transformation that accumulated over the years.

According to the Relative Export Advantage Index (RXA), Türkiye exhibited a competitive advantage, as its RXA values exceeded 1 from 2010 to 2023. Italy, Chile, Greece, Uzbekistan, Spain, and Jordan had a competitive advantage over Türkiye, whereas China, the US, and France had average RXA values of 0.33, 0.78, and 1.05, respectively, indicating that Türkiye had a competitive advantage over these countries. Vollrath's Relative Export Advantage (RXA) index was considered to provide an alternative measure that confirms and complements the findings of the previous competitive analysis. According to this index, Türkiye's modest level of competitive advantage in the early 2010s has been on a marked upward trend since 2017. In particular, the average value of 6.94 achieved over the last five years, encompassing the 2019-2023 period, was considered significant evidence that the country's current competitive advantage has now reached a strong and enduring level, exceeding the country's overall average (3.83), This continuously growing competitive advantage was identified as the primary driver of Türkiye's previously documented capacity to convert convert surplus production into value in global markets and to increase its market share. Theoretically, the Vollrath index prevents double counting by considering both exports and imports, so Türkiye's high score indicates a "real" competitive advantage. Consequently, it was concluded that the RXA index data provide scientific confirmation that the transformation Türkiye has experienced in the peach sector is neither accidental nor cyclical. Rather, it is based on a fundamental competitive advantage that has been methodically built and strengthened over the years (Table 8).

According to the Revealed Symmetric Comparative Advantage (RSCA) index, Spain, Jordan, Greece, Uzbekistan, Chile, Italy, Türkiye, and France exhibited a competitive advantage, as their mean RSCA values were positive and close to

Table 8. Vollrath's index of relative export advantage (RXA) for peaches.

Years	Spain	Chile	Türkiye	USA	China	Italy	Greece	Jordan	Uzbekistan	France
2010	38.19	14.05	1.83	0.95	0.06	7.60	26.75	3.72	12.11	1.35
2011	38.27	15.49	1.47	0.98	0.13	6.48	24.24	6.02	27.09	1.34
2012	34.03	13.90	1.46	0.94	0.16	6.78	31.42	99.76	17.01	1.38
2013	38.83	12.52	1.29	0.84	0.14	5.95	23.85	94.07	9.77	1.31
2014	41.94	12.19	1.75	0.98	0.27	4.07	27.50	63.82	19.08	1.11
2015	39.69	13.78	1.96	0.75	0.41	4.14	22.03	119.23	9.14	1.14
2016	37.38	16.47	1.28	0.74	0.39	3.92	25.79	88.08	21.14	1.05
2017	36.54	13.14	3.42	0.63	0.51	3.18	22.17	87.90	19.02	1.02
2018	39.39	16.87	4.39	0.68	0.40	3.26	22.44	60.63	33.99	0.73
2019	35.03	18.77	4.38	0.66	0.81	2.45	20.27	58.33	26.87	0.67
2020	37.60	14.18	6.89	0.61	0.47	1.85	25.05	51.59	36.99	0.74
2021	40.19	13.28	6.92	0.78	0.27	2.36	10.68	126.24	27.56	0.78
2022	35.16	13.65	8.57	0.71	0.35	3.40	18.41	38.22	46.45	1.07
2023	35.01	26.15	7.95	0.66	0.32	1.80	17.84	69.70	35.87	0.94
Mean	37.66	15.32	3.83	0.78	0.33	4.09	22.75	69.09	24.44	1.05

Table 9. Laursen's revealed symmetric index of comparative advantage (RSCA).

Years	Spain	Chile	Türkiye	USA	China	Italy	Greece	Jordan	Uzbekistan	France
2010	0.92	0.86	0.29	-0.02	-0.88	0.73	0.92	0.58	0.85	0.14
2011	0.92	0.87	0.19	-0.01	-0.75	0.70	0.92	0.71	0.93	0.14
2012	0.91	0.86	0.18	-0.03	-0.69	0.71	0.93	0.98	0.89	0.15
2013	0.92	0.85	0.13	-0.08	-0.74	0.68	0.92	0.98	0.81	0.13
2014	0.92	0.84	0.27	-0.01	-0.54	0.58	0.93	0.97	0.90	0.05
2015	0.92	0.86	0.32	-0.13	-0.39	0.58	0.91	0.98	0.80	0.06
2016	0.92	0.88	0.12	-0.14	-0.40	0.57	0.92	0.98	0.91	0.02
2017	0.91	0.85	0.54	-0.21	-0.30	0.50	0.91	0.98	0.90	0.01
2018	0.92	0.88	0.62	-0.18	-0.40	0.51	0.91	0.97	0.94	-0.15
2019	0.91	0.89	0.62	-0.19	-0.09	0.40	0.90	0.97	0.93	-0.19
2020	0.92	0.86	0.73	-0.23	-0.32	0.29	0.92	0.96	0.95	-0.14
2021	0.92	0.85	0.73	-0.11	-0.53	0.39	0.83	0.98	0.93	-0.12
2022	0.91	0.86	0.78	-0.16	-0.45	0.52	0.89	0.95	0.96	0.03
2023	0.91	0.92	0.76	-0.19	-0.48	0.28	0.89	0.97	0.94	-0.03
Mean	0.92	0.87	0.45	-0.12	-0.50	0.53	0.91	0.92	0.90	0.01

1. France had a competitive disadvantage from 2018 to 2021 and in 2023. China and the United States were found to have a competitive disadvantage. Türkiye had the highest competitive advantage in 2022 with a value of 0.78. Türkiye's competitive advantage was greater than that of the United States, China, and France (Table 9). Duru et al. (2022) calculated the average RSCA value for peach-nectarine exports to be 0.30 over the period 2000–2020. In this study, the RSCA value of peach exports was calculated as 0.45. The main reason for this positive deviation in RSCA values was determined to be the fact that Duru et al. (2022) study included the early 2000s, when competitiveness was not yet established, while this study focused on a more recent and export-oriented period. The study conducted in 2022, the competitiveness of peach exports increased by 50% in the three years following the study conducted in 2022. The RSCA index was considered the most definitive indicator, with values ranging from -1 to +1, thereby corroborating previous findings of competitive advantage and providing a more stable scale. The latest analysis found that the sharp and consistent upward trend in Türkiye's index values, which began in 2017 and peaked at 0.78 in 2022, provides clear evidence of the structural transformation that the country is undergoing. In particular, the average RSCA value of 0.72 between 2019 and 2023 indicated that Türkiye not only possesses a competitive advantage but has also moved into the "strong" category, approaching the levels of traditionally top-tier competitors such as Spain (0.92) and Chile (0.87). This situation was interpreted as indicating that the country's extraordinary performance in production, exports, and trade balance, observed in previous analyses, was not a coincidence but rather reflected measurable specialisation and increasing competitiveness.

4. Conclusion

Türkiye accounted for approximately 4% of global peach production, ranking third after China and Spain. It also accounted for 12.64% of global peach exports, ranking second to Spain. Analyses revealed that Türkiye's self-sufficiency consistently generates a production surplus exceeding 100%, enabling the country to export over 55,000 units per unit of import value, thereby generating a substantial foreign trade surplus. An examination of RCA, RXA, and RSCA values in the peach trade revealed that Türkiye holds a competitive advantage over countries such as China, the US,

and France. Furthermore, across the three competitive-advantage indices used, it has been scientifically demonstrated that Türkiye has experienced a structural increase in its competitiveness since 2017, moving from a modest to a strong advantage (average RSCA for the last five years ≈ 0.72). During this transformation, Türkiye's export volume increased more than fivefold compared to 2010, and export prices per unit increased by approximately 30%, demonstrating that growth focused not only on quantity but also on value.

According to the competitiveness analysis, Türkiye's performance in the peach trade, particularly in recent years, has led to a strong comparative advantage and a favourable position relative to rival countries. Türkiye's ecological structure and self-sufficiency indicate that it has considerable export potential for peach production. It was recognized that Türkiye's advancement from its current position is possible not only through high yields but also by ensuring products meet international quality standards, reducing costs through input support, developing marketing strategies to build regional brand value, and accessing the appropriate export markets. In this context, sustaining volume growth, particularly in growing markets like Russia, and developing brand- and quality-focused strategies to further improve unit prices in high-value-added markets like Germany (considering that Türkiye's average export price per ton lags behind that of its main competitors like Spain) are critical to further advancing Türkiye's current strong position. In addition, it was recommended that investments in agricultural research and development and in modern irrigation and agricultural technologies that increase productivity should be continued to maintain and further increase the strong competitive advantage achieved in recent years.

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