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Essay

Competitiveness and revealed comparative advantage of Mexico's Hass avocado exports

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Abstract

Worldwide, avocado production in Mexico ranks first with 2.39 million tonnes, of which 1.34 million tonnes were destined for export in 2020, contributing more than 42.5% to the world export market. The most important markets for avocados produced in Mexico are the United States of America, Canada, and Japan, where the United States accounted for 77% of Mexican avocado exports in 2020. The competitiveness and revealed comparative advantage of Mexican avocado exports from 2003 to 2020 in the world market were analyzed; the following were obtained in 2020 as values of competitiveness indicators: an export coefficient of 56.2%, an export specialization coefficient of 1.29, a tradability index of 1.29, a revealed comparative advantage index of exports of 0.9 and a normalized revealed comparative advantage index of the exports of -0.05; these last two indicators of revealed comparative advantage refer to exports to the United States of America in 2020. The results obtained reflect the competitiveness and comparative advantage of avocado exports produced in Mexico at the international level.

Keywords:

export, import, indicators, production.

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Introduction

Avocado (*Persea americana* Mill.) belongs to the genus *Persea*, which has about 85 species that are found from the southern United States of America to Chile, concentrating mainly in Mexico and Guatemala; it is a ripe fruit commonly 10 to 15 cm long, with abundant pulp. Among the different varieties of avocado, the Hass variety stands out, whose main advantage is resistance to cold and a high oil content (Barrientos, 1998), which has been increasing its production and expanding its planted area in recent years.

The annual per capita consumption of avocado in 2019 in Mexico was 8 kg person^{-1} (Statista, 2022). The Hass avocado has a high level of consumption due to the benefits it provides to the body; it provides an optimal amount of monounsaturated fat, healthy fat, and according to Ceballos (2013), it is the reason why it is used in different dishes such as dressings, sauces, salads, and pasta, and it is also one of the fruits with high levels of protein of high nutritional value.

Avocado is considered a nutrient-dense fruit, which provides vitamins and minerals; for every 100 g of pulp, it provides 15 g of total fat, 0 mg of cholesterol, 9 g of carbohydrates, 2 g of proteins, in addition to vitamins A, D, C, and E; these nutrients potentiate brain activity as well as improve digestion and absorption of other nutrients (Tovar, 2003).

On the world scene, regarding total avocado production in 2019, Mexico ranks first with 2.3 million tonnes, approximately 32% of the world avocado production; in second place is the Dominican Republic with 661 000 t, 9.2% of the world avocado production and in third place is Peru with 535 000 t, 7.46% of the world avocado production (FAOSTAT, 2021).

Due to the level of its exports, Mexico ranks as the largest avocado marketer in the world due to its percentage of participation in world avocado exports, which was 42.5% in 2020 based on FAOSTAT (2021). The export of avocado to the world market faces the problem of little market diversification since, in 2020, of the total avocado exported from Mexico, 77% was concentrated in the United States of America, with Canada and Japan as the second and third destination countries, with a smaller share of 6.81 and 5.3%. (SIAVI, 2021).

Competitiveness has its antecedents in Smith (1770) theory of absolute advantage; he proposed a theory of interpretation of international trade, referring to the cost discrepancies between countries in the production of the same product.

Authors such as Torres (2005) state that, in the scenario that a country had an absolute advantage in all goods or a country did not have an absolute advantage in any good, it would not promote trade, so it was necessary to reformulate the theory of absolute advantage through the theory of comparative advantage by David Ricardo, in which, in the event of the possibility of any of the scenarios set out above, with absolute advantage in all goods or without absolute advantage in all goods, where trade is not allowed, the exchange would be based on the relative prices of a good (Dornbusch, 1993).

The theory of comparative advantages is complemented by the theory focused on the endowment of resources proposed by Heckscher-Ohlin, where it involves the importance of an aspect that participates in the production of a good, the endowment of the factors of production; in this way, the comparative advantage considers the difference in relative costs and the use of factors, where the good that uses the abundant resource is exported and the good that requires the scarce resource is imported (Oliveras, 1987).

The fact that a country has a comparative advantage in the production of a good may imply that its opportunity cost of producing that good in terms of other goods is lower in that country than in others (labor productivity) or that the country has a greater endowment of the factor used in the production of the good compared to other goods; in both ways, trade between these countries will be beneficial if each one exports the goods in which it has a comparative advantage (Salazar, 2015).

The comparative advantage of a product in a country, when measured, is called revealed comparative advantage in reference to the fact that the measurement of the magnitude of the

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comparative advantage is carried out on products already exported and not on those that, even without being marketed, could develop said advantage.

The presence of the revealed comparative advantage presents two different interpretations; number one considers that the relative cost of carrying out an activity is lower in a country compared to the rest of the world, and number two considers that said country has a wide availability of resources that are essential or of intensive use to carry out said activity. Balassa (1965) coined the term RCA to indicate that comparative advantages can be revealed by the current flow of merchandise trade because the actual exchange of goods reflects relative costs and also differences that exist between countries.

To measure comparative advantage in exports, static indicators are used, among which the revealed comparative advantage index (RCAI) of exports stands out, which reflects the advantages or disadvantages of a country's exports in the world market (Ávila and González, 2012), measuring the degree of importance of a product within exports from one market to another; the results obtained can take values between zero as a minimum and up to infinity as a maximum, so this indicator can take very high values of comparative advantage (up to infinity), which is why a complementary index to the RCAI called the normalized revealed comparative advantage index (NRCAI) has been proposed by Yu *et al*. (2009), which allows the results of the RCAI to be symmetrical, taking values only between -1 and 1 (Sawyer *et al*., 2017); this makes it possible to avoid bias in the calculation of the revealed comparative advantage (Torok and Jambor 2016).

Competitiveness, based on the elements proposed in the theories of Adam Smith and David Ricardo, refers to the real situation of permanence or expansion that a product presents in an international market, which can be distorted both by market failures and by government intervention (Contreras, 1999); that is, it is the state or level of performance of a product in an economic environment where it is marketed for final use or consumption under the laws of supply and demand, which are affected by externalities; in synthesis, it is the level of private profitability according to market conditions.

This implies that comparative advantage differs from competitiveness in that it refers to the specialization of a country in international trade, depending on the relative endowment of factors, in addition to being under assumptions, such as without distortions, full employment, fixed endowment of resources; however, comparative advantage and competitiveness are considered terms in the form of a tiered level, that is, the competitiveness of a product in a market begins with its comparative advantages, associated with its endowment of factors and the country's specialization in the production of the product and can be modified by externalities such as the exchange rate, asymmetric information, monopolies, among others (Cruz *et al*., 2020).

The research work aimed to analyze the competitiveness of Mexico's avocado exports from 2003 to 2020 through international trade competitiveness indicators, such as the export coefficient (EC), export specialization coefficient (ESC), tradability index (TI), the revealed comparative advantage index (RCAI) of exports and the normalized revealed comparative advantage index (NRCAI) in order to obtain an overview of the competitiveness of avocados in the world market.

Materials and methods

Description and analysis were used to present this research. Description consists of determining the current condition and identifying the causes of a phenomenon under study, and analysis consists of breaking down and then recomposing the basic elements of the object of study, starting from the general to the specific (Naghi, 2005), all with the support of descriptive statistics and economic indicators for the analysis of the competitiveness of Mexican avocado exports from 2003 to 2020, with the use of Microsoft© Excel software.

The information used was obtained from institutional databases, such as the statistics of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2022), the Tariff Information System via the Internet (SIAVI, 2022) of the Secretariat of Economy (SE, 2022), the Agri-Food Information

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System of Consultation (SIACON, 2022) and the Agri-Food and Fisheries Information Service (SIAP, 2022) of the Secretariat of Agriculture and Rural Development.

Data on avocado production, import and export variables were used to calculate the following indicators: export coefficient (EC), export specialization coefficient (ESC), tradability index (TI), revealed comparative advantage index (RCAI), and normalized revealed comparative advantage index (NRCAI) of exports.

The export coefficient (EC), according to Durán (2008), indicates the proportion of national production that is exported to other countries, the higher the value of the export coefficient, the greater the competitiveness of exports of this product in the world market. The following formula is used for its calculation (Velín, 2011): CE= (XTx/QTx) * 100. Where: XT_X= total exports of product x; QT_X= total output of product x.

The export specialization coefficient (ESC), according to Durán (2008), allows us to measure the degree to which a country has a comparative advantage, classifying it as an exporter of the product; it relates exports to apparent national consumption (ANC); if the export specialization coefficient exceeds the value of 0, it is a net exporting country, being competitive at the international level in the product. The following formula is used (Velín, 2011):

$$ESC= (Xij)/(Qij+Mij-Xij)$$

Where: Xij= exports of product i of country j; Mij= imports of product i of country j; Qij= domestic production of product i of country j.

The tradability index (TI) is the relationship between the value of the trade balance and the value of apparent consumption; it measures the capacity to generate net exportable surpluses in relation to domestic consumption (Velín, 2011). The formula for its calculation is as follows:

$$TIij=\frac{X_j^i-M_j^i}{Q_j^i+M_j^i-X_j^i}$$

Where: TI_{ij}= tradability index; X_{ij}= exports of product i of country j; M_{ij}= imports of product i of country j; Q_{ij}= domestic production of product i of country j.

In this, if the value of the indicator is greater than zero, the sector is considered an exporter since there is an excess supply (X-M> 0); if it is less than zero, it means that part of the demand is satisfied with imports, it is an importable product, so it is not competitive since production is insufficient to meet demand.

The revealed comparative advantage index (RCAI) of exports compares a country's market share in the export of a good in relation to the total export of that good in the international market and in turn, it is compared with the country's share of the total international export market (Ávila and González, 2012). The formula for its calculation was as follows:

$$RCAI^k=\frac{X_{ij}^k/XT_{ij}}{X_{iw}^k/XT_{iw}}$$

Where: Xkij= exports of product k made by country i to country j; XTij= total exports from country i to country j; Xkiw= exports of product k made by country i to the world (w); XTiw= total exports of country i to the world (w). The results are interpreted as follows: an RCAI greater than 1 means that a country has a revealed comparative advantage in the export of product k; values between 0 and 1 denote a revealed comparative disadvantage in the export of product k; in this way, the indicator can take very high values of comparative advantage and only values from 0 to 1 to indicate comparative disadvantage.

The normalized revealed comparative advantage index (NRCAI), by Yu *et al*. (2009), emerges as a complementary index to the RCAI, allowing the results obtained in its calculation to be symmetrical,

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taking values only between -1 and 1 (Sawyer *et al*., 2017); the following formula is proposed for its calculation (Ramírez *et al*., 2018): NRCAI= (RCAI-1) / (RCAI+1). Where: RCAI= revealed comparative advantage index.

The value of the NRCAI has three ranges; between +0.33 and +1, there is a comparative advantage for country j in exports of product k; between -1 and -0.33, there is a disadvantage for country j in exports of product k; and between -0.33 and +0.33, there is a trend towards intra-product trade.

By using the indicators of revealed comparative advantage, both the RCAI and the NRCAI, it is possible to explain the magnitude of the comparative advantage that a country has in a given product; in addition to this, it is possible to make comparisons of comparative advantage between goods, both over years and markets by their value obtained (Torok, 2016).

Results and discussion

The competitiveness indicators analyzed in this section are export coefficient (EC), export specialization coefficient (ESC), tradability index (TI), revealed comparative advantage index (RCAI) and normalized comparative advantage index (NRCAI), in order to obtain an overview of the competitiveness and revealed comparative advantages of Hass avocado.

The export coefficient (EC), which indicates the proportion of national production that is exported, shows an upward trend; in 2003, it was 0.137, which means that Mexico's avocado exports to the world represented 13.7% of national production and for 2020, it was 0.562, which means that Mexico's avocado exports to the world represented 56.24% of the national production; it obtained its highest value in 2015, which was 0.602, meaning that avocado exports from Mexico to the world represented 60.2% of the national production (Table 1).

Table 1. Variables and indicators of avocado competitiveness in Mexico (t and units).

Year	Q (t)	M (t)	X (t)	EC	ESC	TI
2003	905 041.2	0	124 238.7	0.137	0.159	0.159
2004	987 323.3	421.3	136 495.9	0.138	0.16	0.16
2005	1 021 515.5	0	229 166	0.224	0.289	0.289
2006	1 134 249.6	2 114.1	208 346.4	0.184	0.225	0.222
2007	1 142 892.4	91.5	310 260.3	0.271	0.373	0.372
2008	1 162 428.9	392.8	326 332.8	0.281	0.39	0.39
2009	1 230 972.6	0	396 825.1	0.322	0.476	0.476
2010	1 107 135.2	6 597.7	368 615	0.333	0.495	0.486
2011	1 264 141.5	939.9	400 552.1	0.317	0.463	0.462
2012	1 316 104	923.3	557 693	0.424	0.734	0.733
2013	1 467 837.4	2 211.3	646 812.4	0.441	0.786	0.783
2014	1 520 694.5	73	746 966.9	0.491	0.965	0.965
2015	1 644 225.9	0	989 720.6	0.602	1.512	1.512
2016	1 889 353.5	17.6	1 022 210.1	0.541	1.179	1.179
2017	2 029 885.9	0	989 652.6	0.488	0.951	0.951
2018	2 184 663.1	0	1 198 202.8	0.548	1.215	1.215
2019	2 300 888.9	0	1 280 930	0.557	1.256	1.256
2020	2 393 848.6	0	1 346 215.4	0.562	1.285	1.285

FAOSTAT (2020); SIAP (2021). Where: Q= production; M= imports; X= exports; EC= export coefficient; ESC= export specialization coefficient; TI= tradability index.

The results obtained in the export coefficient as well as in the data on production, export and import variables are similar to those of Urquiza *et al*. (2015), where they analyzed the value of avocado

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exports from Mexico to the world market from 2001 to 2010 with a methodology of comparison of values between exports and production, identifying an intensified growing behavior of both exports and the relationship between exports and production from 2003 to 2010; average values of 33% are obtained from 2008 to 2010, indicating the magnitude of the national production that is exported to the world market and in the present research, approximate values of 0.325 or 32.5% are obtained for the same period, explaining the importance of the increase in avocado exports, considering it as a viable investment option.

The export specialization coefficient (ESC) in 2003 was 0.159; being a value less than 1, it means that Mexico was not a large exporter of avocado; it was 1.285 for 2020 and being a value greater than 1, it reflects that avocado exports are greater than apparent national consumption in this period; in 2015, 2016, 2018, 2019 and 2020, it also presented values greater than 1, which makes Mexico more competitive internationally in avocado, Table 1; the results of this indicator are similar to those obtained by Cruz *et al*. (2022), where the value of the export openness degree index (ED) was analyzed, which uses the same methodology of the export specialization coefficient (ESC), identifying an increasing behavior of the value of the index from 1995 to 2020, with values similar to the present research in 2016, 2018, 2019, and 2020, with an ED greater than 1, explaining the role of Mexico as an avocado exporting country.

The tradability index (TI) had an increasing behavior in the degree of importance of avocado in Mexico's agricultural exports to the world market; in 2003, the value of the index was 0.159 and being higher than 0, it means that, in Mexico, the degree of importance of avocado in agricultural exports to the world market was important and the value was 1.285 by 2020 and being greater than 1, it reflects that exports are greater than apparent national consumption and means that, in Mexico, the degree of importance of avocados in agricultural exports to the world market was high; in 2015, 2016, 2018, 2019, and 2020, it presented values greater than 1, which makes avocado a product of a high degree of importance in Mexico's agricultural exports to the world market (Table 2); these results are similar to those presented by Cruz *et al*. (2022), as they show an increasing trend in the value of the index from 1995 to 2020, with similar index values in 2016, 2018, and 2019, with a TI greater than 1, which means a high degree of importance of avocado in Mexico's agricultural exports to the world market, considering Mexico a country with a large export capacity due to its excess supply of avocado.

Table 2. Mexico's avocado exports (t).

Year	Exports to the world	Exports to the United States		Exports to Japan		Exports to Canada	
	(t)	(t)	(%)	(t)	(%)	(t)	(%)
2003	124 238.7	39 522.7	31.8	24 351.3	19.6	11 419.8	9.2
2004	136 495.9	40 042.1	29.3	10 857	8	18 474.7	13.5
2005	229 166	145 110.6	63.3	26 459.4	11.5	17 468.9	7.6
2006	208 346.4	118 809.2	57	28 807.5	13.8	17 148.2	8.2
2007	310 260.3	228 382.2	73.6	24 829.4	8	19 604	6.3
2008	326 332.8	249 262.4	76.4	23 748.5	7.3	18 095	5.5
2009	396 825.1	308 622.2	77.8	27 223.5	6.9	22 583.2	5.7
2010	368 615	269 985.4	73.2	40 587.3	11	25 180.9	6.8
2011	400 552.1	321 521.6	80.3	33 274.6	8.3	22 891.2	5.7
2012	557 693	432 847.4	77.6	52 757.8	9.5	33 225.5	6
2013	646 812.4	516 276.7	79.8	54 005	8.3	34 079.2	5.3
2014	746 966.9	612 002.6	81.9	52 976.9	7.1	36 411.2	4.9
2015	989 720.6	808 309.7	81.7	55 467.6	5.6	54 459.1	5.5
2016	1 022 210.1	790 929.2	77.4	68 866.5	6.7	66 480.4	6.5
2017	989 652.6	770 686.1	77.9	55 544.1	5.6	76 936.9	7.8

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Year	Exports to the world	Exports to the United States		Exports to Japan		Exports to Canada	
	(t)	(t)	(%)	(t)	(%)	(t)	(%)
2018	1 198 202.8	917 069.7	76.5	66 857.1	5.6	89 614.1	7.5
2019	1 280 930	992 099.6	77.5	71 567.1	5.6	87 798.7	6.9
2020	1 346 215.4	1 036 561.6	77	70 942.7	5.3	91 932.6	6.8

FAOSTAT (2020); SIAVI (2021).

The main destination markets for Mexican Hass avocados are the United States of America, Canada and Japan (Table 2); in 2020, of the total avocado exports to the world, 77% was destined for the United States of America, 6.8% for Canada, and 5.3% for Japan. The behavior of avocado exports to the main consuming country, the United States of America, has shown an upward trend, indicating a constant increase in demand from this country and from 2007 to 2020, it has maintained a percentage of participation of Mexico's total avocado exports to the world above 70%.

In relation to the revealed comparative advantage index (RCAI) of avocado (Table 3), with the United States of America, it was 0.359 in 2003; being less than 1, it means that the degree of importance of avocado in Mexico's agricultural exports to the United States of America was small and it was 0.902 in 2020 and being close to 1, this value reflects a greater degree of importance of avocado in Mexico's agricultural exports to the United States of America and in 2008 and 2011-2015, it was greater than 1, which means that Mexico presented a greater degree of specialization in avocado exports to the United States of America, compared to the rest of the world, having a revealed comparative advantage in Mexico's avocado exports to the United States of America in that period (Table 3).

Table 3. Indicators of revealed comparative advantage (RCAI) and normalized revealed comparative advantage (NRCAI).

Year	RCAI Mexico-USA	NRCAI Mexico-USA	RCAI Mexico-Japan	NRCAI Mexico-Japan	RCAI Mexico-Canada	NRCAI Mexico-Canada
2003	0.359	-0.472	8.806	0.796	8.042	0.779
2004	0.338	-0.495	22.934	0.916	10.724	0.829
2005	0.77	-0.13	3.559	0.561	5.220	0.678
2006	0.678	-0.192	5.086	0.671	3.276	0.532
2007	0.925	-0.039	2.738	0.465	1.75	0.273
2008	1.024	0.012	2.108	0.356	1.75	0.273
2009	0.974	-0.013	3.379	0.543	1.871	0.303
2010	0.921	-0.041	3.721	0.576	1.968	0.326
2011	1.04	0.019	2.988	0.499	1.755	0.274
2012	1.019	0.009	3.002	0.5	2.229	0.381
2013	1.029	0.014	2.634	0.45	2.728	0.463
2014	1.061	0.03	2.455	0.421	2.499	0.428
2015	1.035	0.017	2.162	0.368	2.543	0.436
2016	0.978	-0.011	2.667	0.455	2.64	0.451
2017	0.991	-0.005	2.036	0.341	2.909	0.488
2018	0.981	-0.01	2.167	0.369	3.122	0.515
2019	0.951	-0.025	1.993	0.332	3.256	0.53
2020	0.902	-0.051	1.886	0.307	3.905	0.592

FAOSTAT (2020).

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The results obtained in this research are similar to those obtained by Villegas (2021), where the revealed comparative advantage index was analyzed for Mexican avocados exported to the United States of America from 2001 to 2019, identifying an increasing behavior of the value of the index from 2003 to 2019, with values similar to those obtained in the research from 2011 to 2015, with an RCAI close to 1 with a minimal difference of hundredths, reflecting the presence of comparative advantage in Mexico's avocado exports to the United States of America; the minimum value of the RCAI is found in the same period, with 0.343 in 2003.

The revealed comparative advantage indicator (RCAI) of avocado (Table 3), with Canada was 8.042 in 2003; being greater than 1, it reflected that the degree of importance of avocado in agricultural exports from Mexico to Canada was high and it was 3.905 in 2020; this value greater than 1 shows a high degree of importance of avocado in agricultural exports from Mexico to Canada and from 2003 to 2020, in all years it presented values greater than 1, which means that Mexico presented a higher degree of specialization in avocado exports to Canada compared to the rest of the world, having a revealed comparative advantage in Mexico's avocado exports to Canada from 2003 to 2020 (Table 3).

The results obtained in this research are similar to those obtained by Villegas (2021), where the revealed comparative advantage index was analyzed for Mexican avocados exported to Canada from 2001 to 2019, with a constant behavior of the value of the index between 2012 and 2016, with values similar to those obtained in the present research, with an RCAI of 2 with minimal differences in tenths of a unit, showing a comparative advantage in Mexico's avocado exports to Canada; there is a minimal difference in the results from 2007 to 2011, where the author obtains RCAI values greater than 2 and in the present research, the minimum value of that period is 1.75.

The revealed comparative advantage indicator (RCAI) of avocado (Table 3), with Japan was 8.81 in 2003; being greater than 1, it means that the degree of importance of avocado in agricultural exports from Mexico to Japan was high and from 2003 to 2020, in all years it presented an average constant behavior, an RCAI value of 2; therefore, being a value greater than 1, Mexico presented a higher degree of specialization in avocado exports to Japan, compared to the rest of the world, having a revealed comparative advantage in avocado exports from Mexico to Japan from 2003 to 2020 (Table 3).

A value greater than 1 in the RCAI reflected that the quotient between avocado exports from Mexico to country J and agricultural exports from Mexico to country J is greater than the quotient between avocado exports from Mexico to the world and total agricultural exports from Mexico to the world; if both quotients were equal, the value would be 1; for Mexico to have an RCAI greater than 1, it requires that the percentage of avocado exports to country J be significant in total agricultural exports to country J, so some causes of this situation could be an exclusive increase in avocado exports to country J and that total agricultural exports to country J are maintained or decreased; this happens in situations of exportable avocado production surpluses, increased interest in avocado production, causing a change of crop planting by farmers towards the search for more profitable crops, among others.

The normalized revealed comparative advantage index (NRCAI) of avocado exports (Table 3), expresses the additional competitiveness that an exporter has; for the United States of America, it was -0.47 in 2003; being between -1 and -0.33, it reflects some comparative disadvantage in avocado exports to the United States of America and it was -0.05 in 2020, which is in the range of -0.33 and +0.33, which reveals a trend towards intra-product trade with the possibility of presenting comparative advantages in avocado exports to the United States of America; in 2008 and from 2011 to 2015, positive values were obtained; however, they were lower than +0.33, which translates into a minimum magnitude of comparative advantage in avocado exports to the United States of America in this period (Table 3).

The results obtained in this research are similar to those obtained by Villegas (2021), where the normalized revealed comparative advantage index was analyzed through the use of a methodology similar to that used in the present research for Mexican avocados exported to the United States of America between 2001 and 2019; they identified an increasing behavior of the value of the

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index from 2003 to 2019, which demonstrated the presence of comparative advantage in Mexico's avocado exports to the United States of America; the minimum value of the NRCAI is found in the same period, with -0.47 in 2003.

The normalized revealed comparative advantage index (NRCAI) of avocado exports (Table 3), with Canada was 0.78 in 2003; being in the range of +0.33 to +1, it reflected a trade with comparative advantages in avocado exports to Canada, and it was 0.59 in 2020, which is in the range of +0.33 to+1, which demonstrates comparative advantages in avocado exports to Canada; during the period of analysis of this research, from 2003 to 2020, the positive values obtained, although they were less than +0.33, show a decrease in the comparative advantage in avocado exports to Canada in that period (Table 3); the results obtained are similar to those of García *et al*. (2012), where the normalized revealed comparative advantage index was analyzed for new markets, including Canada, from 1994 to 2009, where the author uses a methodology similar to that used in this research.

The normalized revealed comparative advantage index (NRCAI) of avocado exports of Mexico (Table 3), with Japan was 0.79 in 2003; being in the range of +0.33 and +1, it reflects the presence of comparative advantage in avocado exports to Japan and it was 0.307 in 2020, which is within the range of -0.33 and +0.33, which translates into intra-product trade, with a trend towards comparative advantages in avocado exports to Japan; in the period of analysis of this research, from 2003 to 2020, the value of the NRCAI presented a positive behavior with a decreasing trend to a value greater than 0.33, which explains a position of comparative advantage in avocado exports to Japan between 2003 and 2020 (Table 3).

Conclusions

The analysis of the competitiveness of Mexico's avocado exports to the world denotes a growing increase in the competitiveness of exports to new markets, such as Canada and Japan.

At the national level, more than half of the amount of avocado produced in Mexico is exported, which is why Mexico has the role of the largest avocado exporting country due to the value that exports represent to world markets, causing an increase in interest on the part of Mexican producers towards an increase in the area destined for avocado production.

Based on the behavior of avocado production and export levels, as well as competitiveness indicators, a trend towards an increase in the world demand for avocados produced in Mexico is expected; it is beneficial to exploit its advantages to increase its participation in the world market; a trend towards an increase in the competitiveness of avocado exports to the main destination markets was observed; however, despite the efforts made to open up to new markets, three out of every four avocados exported are destined for the United States of America.

A country that has a comparative advantage in the export of a product presents a pattern of specialization in international trade; at an international competitive level, Mexico has exponentially increased the planting, production, and export of avocado in recent years, as reflected in the parameters of competitiveness measurement. Balassa's RCA index showed that Mexico has an RCA to the United States for all consecutive years. Mexico's RCA with respect to Canada and Japan is growing, which is reflected in the competitive position supported by these indices.

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