



The Impact of Food Safety Criteria on Fruit and Vegetable Exports from Türkiye to The European Union

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ABSTRACT

Food safety has become an increasingly important issue as people become more concerned about access to healthy food. Particularly in affluent societies such as the European Union, the increasing consumption of unhealthy fruits and vegetables and carcinogenic residues are constantly on the agenda. Reducing aflatoxin levels in dried foods to below health risk levels, eliminating them from food and ensuring access to healthy food are essential for food safety and human health. In this study, the impact of food safety practices in fruit and vegetable trade between the European Union and Türkiye was examined using mandarins, one of Türkiye's main fresh fruit and vegetable exports, and the European Union Rapid Alert System for Food and Feed (RASFF) notifications for food and feed for the period between 2019 and 2022. The reasons for these notifications and the requests made in this context were examined and a TOWS analysis matrix was created based on the findings obtained. In conclusion, residue and aflatoxin inspections should be included in traceability activities in Türkiye. Producers need to be informed to ensure the effectiveness of inspections. It is crucial to provide adequate support to producers to improve storage conditions for perishable and dry products and to encourage the use of the latest production techniques. It is of great importance to raise awareness of these techniques among producers. Thus, the European Union can be an alternative market to the Russian Federation, which is Türkiye's largest trading partner.

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Introduction

With the increase in the human population, which has reached eight billion people, it has become necessary to increase agricultural production in the world. In this context, there is an increase in the amount of synthetic fertilisers and pesticides used with the developing modern agriculture. This situation has become a threat to human health and food safety measures have increased rapidly in recent years, especially in developed countries. Some food safety problems have led to the emergence of important trade problems within the scope of the World Trade Organisation (WTO). In international trade, the role of food safety measures taken by countries in shaping international competition is quite high (Xiong and Summer, 2013).

Commercially produced citrus fruits in Türkiye are oranges, mandarins, lemons and grapefruit, and the species called citrus is not produced commercially due to its bitter taste and is generally used as rootstock for other citrus fruits (Güven, 2010).

The issue of food sufficiency dates back to Malthus' "An Essay on the Principle of Population of 1798" (Rosegrant and Cline, 2003). Malthus stated that the problem of food insufficiency would arise due to the geometric increase in human population and the arithmetic increase in food resources, and that the strong would continue to live as a result of natural selection (Akdoğan Gedik, 2020).

In The State of Food Insecurity in The World (FAO, 2001) report, the Food and Agriculture Organisation of the United Nations (FAO) defined food security as "the continuous physical and economic access of all people to sufficient, healthy, reliable and nutritious food in order to meet their nutritional needs and food priorities necessary for an active and healthy life at all times". This definition, which also includes food security within the concept of food security, is the definition used today (Koç and Uzmay, 2015).

Food security became an international problem in the 1940s due to the negative effects of the Second World War on agriculture and food production on a global scale. In the Universal Declaration of Human Rights, it was stated that access to food is a fundamental human right and the foundations of the “food security” approach were laid (Koç and Uzmay, 2022).

Food security is a multi-layered concept and has four basic layers. These are availability and stability, accessibility, availability, and sustainability (CFS, 2009). For food security to be fully achieved, all four dimensions must be realised at the same time (FAO, 2008). These are briefly explained (Kıymaz and Şahinöz, 2010):

- Availability of food: Sufficient quantities of food should be consistently available.
- Access to food: Sufficient economic resources must be available to access nutritious and appropriate food.
- Food utilisation: Appropriate utilisation should be based on basic knowledge of nutrition and health, as well as access to adequate water and sanitation.
- Food Sustainability: Food security should be sustained and the obstacles to it should be removed.

Food security is a concept that has gained importance in recent years. Increasing population, disruptions in food supply make the need for access to healthy food and food security practices mandatory. Due to the rapidly spreading globalisation trend in the world, competition in international markets is increasing. Countries have entered into various economic integration movements both to protect themselves from intense competition and to benefit more from the process of integration with the world. These important changes in world trade have led to changes in foreign trade policies of countries (Uyar, 2000). According to the classical economic theory, each country mutually benefits from international trade (Kara, 2005). Therefore, development is realised through trade and regional economic cooperation, which have an impact on the development of relations between countries (Terin et al., 2012). Food safety has also gained importance within the framework of the intensity of existing cooperation and the benefits it brings.

Sanitary measures include measures applied in food production, processing and distribution to reduce risks to human health. These include controls and inspections to ensure that food meets hygienic standards and can be consumed in a healthy and safe manner. SPS is regulated under the “Sanitary and Phytosanitary Measures Agreement” (SPS Agreement), an agreement established by the World Trade Organisation (WTO). This agreement regulates the application of sanitary and phytosanitary measures between WTO member countries and ensures fair and scientifically based measures in international trade.

It is envisaged that the member countries of the World Trade Organisation will regulate national measures on food safety in accordance with international standards. This approach constitutes the legal basis of good agricultural practices. As a result of increasing environmental awareness in the European Union, European Food Retailers prepared the GLOBALGAP (EUREPGAP) Protocol in 1997 (Bayraktar and Saner, 2016). The items listed here define the minimum standards accepted by leading European retailers. In 2007, the logo and name of

EUREPGAP was changed and it was named GLOBALGAP (Gündüz, 2002).

In Türkiye, Good Agricultural Practices (GAP) is a system that is more known, used and preferred by both producers and consumers than GLOBALGAP (Eraktan, 2017). However, with the COVID-19 pandemic, it is predicted that the transition to internationally recognised GLOBALGAP practices will also increase in Türkiye (Akbulak and Şen, 2021). The most widely used GLOBALGAP standard is the Integrated Farm Assurance (IFA) standard, which applies to fruit and vegetables, aquaculture, floriculture, animal husbandry and more. This standard is also the basis for the GLOBALGAP Number (GGN) label, a consumer label for certified, responsible agriculture and transparency (Anonymous 1).

Initially, certification was carried out in the production of fresh vegetables and fruits and cut flowers, but today certification is carried out in three different areas and in many products (Öner Aba, 2018).

- Within the scope of plant production (fruit and vegetables, flowers and ornamental plants, field products, plant production materials, tea, etc.)
- Within the scope of animal production (cattle, calves, sheep, dairy farming, pigs, poultry, Türkiyes, etc.)
- Within the scope of aquaculture (fish species, crustaceans, molluscs, etc.)

Large retailer groups in the European Union have gathered the minimum standards required for agricultural products grown in their own countries or imported from abroad under the name GLOBALGAP in order to ensure the consumption of healthy and quality products. In addition, GLOBALGAP also encourages the implementation of the HACCP system and supports its principles (Kızılaslan and Yalçın, 2012). Food safety is an indispensable part of food quality. Therefore, every approach to ensure food safety will also affect quality. Hazard Analysis and Critical Control Points (HACCP), which is basically a food safety approach, can also be considered as a quality assurance system (Topoyan, 2003). The aim of the HACCP system is to determine the biological, chemical and physical hazard points that may cause contamination starting from raw materials and components in food production and to produce a safe food by controlling them (Boyacıoğlu, 1998).

Food safety refers to the whole set of measures taken to eliminate physical, chemical, biological and all kinds of damages that may occur in foods (Koç and Uzmay, 2015). According to the report published by FAO and World Health Organisation (WHO) in 2003, food safety refers to “all hazards that can make food chronically or acutely harmful to the health of consumers” (FAO and WHO, 2003). Although a conceptual distinction between food safety and food safety is expressed and defined in this way, the concept of food safety in the literature can be used to mean or include food safety (Topçu, 2019).

Türkiye’s largest trade partner in the trade of fruit and vegetable is the Russian Federation. In 2022, Türkiye exported a total of 1.905.283.000 USD worth of products to the Russian Federation, of which 274.393.000 USD was made through mandarins. In the light of this result, Russia is the country to which Türkiye exports the most mandarins. European Union is also an important trade partner of Türkiye. Based on mandarin, when Türkiye’s

mandarin exports to the European Union are analysed, it is understood that there is an export volume of approximately 37.000.000 USD. In this context, Russia can be seen as the first market for the mandarin market and the European Union can be seen as another substitute market for the Russian market.

Mandarin exports constitute a significant portion, 6.02%, of the fruit and vegetable trade from Türkiye to the European Union (EU). In light of this, it is conducted a TOWS analysis to examine the impact of EU food safety criteria, practices, and monthly RASFF notifications on this trade. The analysis focused on the RASFF notifications between 2019 and 2022, specifically those related to mandarins, and it is evaluated the mandarin trade between the European Union and Türkiye based on this information. Policies were established based on the strategies identified following the TOWS analysis, which were tabulated.

Food Safety and Mandarin Exports

Applications in Food Safety

Looking more closely at the issue of food safety, it is possible to see examples of food controls and standards for the health of consumers in the past. However, both the threats in food and the measures taken against them have increased over time. In this period of significant increases in yield and production, called the green revolution, the ecological balance began to deteriorate as a result of unconscious and excessive use of chemical fertilisers or pesticides; negative effects on the environment and human health have emerged. For this reason, the concepts of sustainable agriculture and food safety have started to be discussed with increasing consumer awareness in developed countries (Topçu, 2019).

The main purpose of the General Agreement on Tariffs and Trade (GATT), which was signed in 1947 with the participation of 23 countries, was to make progress towards the liberalisation of world trade and to discipline international trade with a different mindset. In this context, mutual and gradual reduction of tariffs and harmonisation of customs regulations, removal of non-tariff barriers or their transformation into tariffs (tariffication) were aimed (Akman and Yaman, 2008). Since 1947, it was aimed to advance this liberalisation through negotiations. As a result of the Uruguay Round Negotiations, the World Trade Organisation (World Trade Organisation) was established to replace the GATT with the Marrakesh Agreement of 1994. The European Union and many non-member countries of the European Union are also parties to this agreement.

EU, one of the important actors in the export and import of world agricultural products, has established the RASFF in order to ensure that the food products it imports are safe. Although not a member of RASFF, many countries are affected by this system due to their exports of agricultural and food products to the EU (Çebi and Olhan, 2017). Regulation No. 178/2002 of the Parliament and of the Council, which forms the basis of food safety policy in the EU, also forms the basis of food imports to the EU. According to Article 11 of the said Regulation, in order for food to enter the EU market; it must meet EU standards or at least equivalent food standards (Anonymous 2). Rapid Alert System for Food and Feed (RASFF) is a system

established by the European Union in 1979. The main purpose of the system is to ensure rapid exchange of information between member states for problems arising from risks that may arise in food and feed products, to take necessary measures and to protect consumers (Kugu et al., 2022). RASFF notifications are reports obtained as a result of the examination of samples taken from foods that are considered to pose a risk to food safety. Notifications can be of four different types: warning, information, border denial and news (Anonymous 3).

RASFF notifications are a common occurrence especially in Türkiye's fresh fruit and vegetable trade. This situation puts exports in trouble and may result in the destruction of the exported products.

Food Safety and Practices in Türkiye

With the increase in the diversity of food products, the fact that they go through many processes and stages from the field to the table raises questions about whether the food is healthy or not. Adulteration and imitation are very important in terms of food safety (Kantaroglu & Demirbaş, 2019). Questions such as how the production is carried out, whether additives are added, whether health and sanitation rules are paid attention to, whether the production places are adequately inspected, whether the tools and equipment used are suitable for production are in the minds of conscious consumers (Sanchez et al. 2001). As a result of the development processes of countries, more attention has started to be paid to the content, reliability and healthiness of foods. As an example of these situations, traceability in the food sector is of great importance (Caswell et al. 2002).

In Türkiye, there have been some problems regarding food safety for many years. The main problems are; inadequacy of technical infrastructure from agriculture to processing industry, lack of technical personnel, inadequate training and awareness raising of producers and consumers, low purchasing power of consumers in general, weak use of technology (Erden, 2012).

Food legislation has been introduced to standardise these issues. Food legislation is basically the name given to the whole of the laws, by-laws and regulations issued to protect the consumer and determining the qualifications of the places where foodstuffs are produced, stored and sold in general terms. The first law on food safety in Türkiye is the Municipal Law No. 1580 enacted in 1930. Article 15 of this law listed the inspection of food production, storage and sales places within the municipal boundaries among the duties of the municipality. Paragraphs 2, 3, 28, 58 and 61 of these articles define the scope of this duty quite broadly (Giray and Soysal, 2007).

As noted by Barbaros et al. (2007), when fruit and vegetable exports are considered in general, Türkiye has a clear comparative advantage over other countries in raisins, dried figs, dried apricots, and hazelnuts. China, Türkiye and Brazil are the main suppliers of foodstuffs to the EU market. However, these countries should implement strict food safety regulations and measures based on RASFF notifications in order to gain a sustainable competitive advantage (Jaud et al., 2009). The excessive number of RASFF notifications for Türkiye, as in many developing countries in the food industry, may be due to insufficient resources and infrastructure (Çobanoğlu, 2013).

Contrary to popular belief, Türkiye is not completely self-sufficient in all agricultural products. While the EU is self-sufficient in cereals, meat and milk groups, it is found to be self-sufficient in fruit and vegetable groups. In Türkiye, on the other hand, a trend in the opposite direction of the EU is observed; Türkiye is self-sufficient in fruit, vegetable and meat groups, while it is self-sufficient in cereals and milk groups (Niyaz and İnan, 2016).

The development of the global economy in the world and the fact that products are consumed in regions much different from the places where they are produced have revealed the necessity of more controlled monitoring of each stage of the product. With the developing technology, various computer-based software, interdisciplinary approaches and technological devices and new methods that facilitate the tracking of products have started to be used (Cebeci, 2006).

Although there are not many scientific studies on product verification and traceability systems in Türkiye, traceability services have started to be provided over the internet with the help of programmes established by certain organisations, user manuals have started to be published, courses and seminars have started to be organised and the demand for traceability systems has increased by large-scale companies (Çetin, 2014).

Türkiye's main and urgent problem in the field of food safety is the inability to record and control all components of food production practices. The lack of adequate control over the production, import and use of additives, which pose a high risk to public health and threaten public health if not used in appropriate doses, is a serious problem (Kantaroglu and Demirbaş, 2019).

Briefly summarised, the most important problems in the field of food safety in Türkiye are traceability, deficiencies in the use of various technical knowledge and technology, problems in the implementation of the legislation and in this context, the excess of RASFF

notifications in the export of products produced to the European Union can be shown as an example.

Mandarin Export Structure of Türkiye to the European Union and Other Countries

Citrus cultivation, which has a very old history in Türkiye, has developed rapidly after the Republic and has witnessed significant production increases until today. With its climate and soil structure, Türkiye is a country with extremely favourable ecological conditions for citrus cultivation. These citrus species are produced in the Black Sea, Aegean and Mediterranean regions of Türkiye (Oral, 2014).

Mandarin production in Türkiye by years is given in Table 1. Looking at the production, it can be predicted that there is an increasing trend from 1990 to 2022 and this production will increase based on the number of non-fruited trees.

There is an increasing interest in European markets for mandarin, which is an early variety, and as a result, mandarin exports from Türkiye are gaining great importance and mandarin exports are of great importance in fresh fruit exports. Due to its favourable growing conditions and considerable export potential, it is of great importance for Türkiye to examine the production and marketing of this product (Can and Sulusoglu, 2019).

According to the data of 2022, mandarin is the most exported fresh fruit and vegetable product of Türkiye to the world countries. In this context, the total number of mandarin exports is given in Table 2.

Russia is an important trade partner in citrus exports. Russia ranks first in the list of the countries importing the most citrus fruits in the world, followed by France, Germany, the Netherlands and the UK (Atlı and Söyler, 2018). In this context, the price and quantity of mandarin exported by Türkiye to Russia are given in Table 3.

Table 1. Mandarin Production by Years (Source: TÜİK, 2023)

	Number of fruit-bearing trees	Number of non-fruit-bearing trees	Production (Tonnes)
1990	6.858.000	986.000	345.000
1995	7.825.000	793.000	453.000
2000	8.370.000	847.000	560.000
2005	9.230.000	1.347.000	715.000
2010	9.488.000	1.777.000	858.699
2015	11.786.000	2.230.000	1.156.365
2020	15.926.000	5.842.000	1.585.629
2022	19.620.000	5.054.000	1.865.000

Table 2. Quantity and value of mandarin exported from Türkiye to the world for the last five years (Source: Trademap, 2023)

2018	Production (Tonnes)	601.137
	Production Value (\$)	241.202
2019	Production (Tonnes)	665.475
	Production Value (\$)	297.951
2020	Production (Tonnes)	788.380
	Production Value (\$)	390.285
2021	Production (Tonnes)	841.889
	Production Value (\$)	399.948
2022	Production (Tonnes)	819.614
	Production Value (\$)	418.667

Table 3. Mandarin exports of Türkiye to Russia (Source: TÜİK, 2023).

	2018	2019	2020	2021	2022
Value (Thousand \$)	119.859	163.833	219.576	235.210	274.393
Production (Tonnes)	245.308	305.460	417.819	438.679	467.759

Table 4. Main products most exported from Türkiye to the European Union (Source: Trademap, 2023)

Product	2020 production amount (tonnes)	2021 production amount (tonnes)	2022 production amount (tonnes)	Shares of the most exported products in 2022 (%)
Tomato	127.182	180.401	192.077	22.73
Hazelnut in shell	107.902	148.556	136.011	16.09
Lemon	92.925	104.201	116.197	13.75
Pepper	93.244	113.186	100.806	11.93
Watermelon	37.381	30.238	70.911	8.39
Grapefruit	81.698	59.364	58.441	6.92
Mandarin	53.829	49.665	50.865	6.02
Fresh or dry fig	46.353	48.584	45.741	5.41
Cucumber	32.372	46.493	39.127	4.63
Carrot and Radish	31.135	32.030	34.888	4.13
Total	704.021	812.718	845.064	100.00

Table 5. The most exported fresh fruit and vegetables from Türkiye to the European Union (Source: Trademap, 2023)

Product	2020 export value (thousand USD)	2021 export value (thousand USD)	2022 export value (thousand USD)	Percentage shares of export value of the top ten products in 2022 (%)
Fresh or dried hazelnuts	770.724	959.362	727.786	44.98
Tomato	109.563	158.371	210.634	13.02
Fresh or dry fig	164.975	190.602	155.105	9.59
Pepper	109.704	135.830	144.304	8.92
Shelled Pistachios	56.667	107.722	118.287	7.31
Lemon	67.094	64.843	79.085	4.89
Cherry	138.336	125.089	60.944	3.77
Various Tropical Fruits	45.262	54.446	52.332	3.23
Mandarin	35.138	33.331	36.973	2.29
Cucumber	28.278	41.074	32.584	2.01
Total	1.525.741	1.870.670	1.618.034	100.00

Table 6. Comparison of mandarin production and price with other most exported citrus fruits (Source: Trademap, 2023)

Ürün	Production (ton)	Export value (Bin \$)	Share in citrus production (%)	Share in citrus export value (%)
Lemon	116.197	79.085	49.66	51.83
Grapefruit	58.441	31.797	24.98	20.84
Mandarin	50.865	36.973	21.74	24.23
Orange	8.465	4.726	3.62	3.10
Total	233.968	152.581	100.00	100.00

Dry and fresh fruit and vegetable exports to the Russian Federation are subject to various legislation. In this context, exports of fresh fruits and vegetables from Türkiye to the Russian Federation (RF) are carried out within the framework of the Memorandum of Understanding (Memorandum) which entered into force on 02 July 2008 and the Additional Memorandum signed on 09 April 2009 (Anonymous 4). These rules are mainly on standardisation and determination of pesticide residues. In the letter numbered E-21817801-305.04.02.02-5156332 of the General Directorate of Food Control under the Ministry of Agriculture and Forestry, it is stated that pesticide residue analysis should not be performed on every batch of products in the export of fresh fruits and vegetables to the Russian Federation and that the export of products can be allowed with the Safety Certificate, Form-1, Analysis

Report and Phytosanitary Certificate for the appropriate batch according to the Russian Federation Maximum Residue Level list (Anonymous 5).

Mandarin ranks seventh in the list of the most exported fresh fruit and vegetable products of Türkiye to the European Union. The first in this list was tomato, the second was hazelnut and the third was lemon (Table 4).

Mandarin ranks ninth in the ranking of the export value of Türkiye's most exported fresh fruit and vegetable products to the European Union. In this list, hazelnuts ranked first, tomatoes second and figs third (Table 5).

In addition, when the exported citrus fruits are examined, it is seen that 50.865 tonnes of mandarin were exported according to the data of 2022. Mandarin is the second most exported citrus fruit according to 2022 data (Table 6).

Thomas Robert Malthus argued that due to the exponential growth of the human population, the fertility of the land would only increase arithmetically. As a result, resources would eventually become insufficient to support a constantly increasing population. Therefore, he believed that it may be necessary to consider restricting reproduction (Malthus, 1798; Karaca, 2022). At present, this argument cannot be applied. Although boosting production is crucial to meet the needs of the global population, it also gives rise to concerns regarding food safety. Although boosting production is crucial to meet the needs of the global population, it also gives rise to concerns regarding food safety.

This study analyses the food safety implications of Türkiye's mandarin exports to the European Union between 2019 and 2022 in the context of RASFF notifications. This study analyses the food safety implications of Türkiye's mandarin exports to the European Union between 2019 and 2022 in the context of RASFF notifications. The aim of this unique study is to develop strategies to address this issue in order to minimise export losses.

Material and Methods

In this study, the effects of food safety on mandarin trade between Türkiye and the European Union are analysed. In this context, the strengths, weaknesses, opportunities, and threats of this trade structure were determined and subjected to TOWS analysis by examining the literature reviews and RASFF notifications given by the European Union countries. SWOT analysis of internal strengths and weaknesses as well as external opportunities and threats is important for strategy formulation and development (Chang and Huang, 2006). TOWS analysis is a type of analysis based on associating threats and opportunities with weaknesses and strengths in the strategies to be formed (Wehrich 1982). The TOWS matrix is created, strengths and weaknesses, opportunities and threats are written on the matrix and strategies are created within this framework.

As a result of the analysis, strengths, weaknesses, opportunities and threats aspects of the mandarin export structure were identified. Based on these arguments, strategies were developed on the status of export and how to improve it and what the strategy can be.

Findings and Discussion

Türkiye has advantages such as geographical location, favourable climatic and environmental conditions, sufficient and diverse production amount, high yield in production areas. In addition to these advantages, there are serious problems in production, marketing, transport, storage and packaging. Problems arising from production and marketing prevent higher income from both domestic and foreign markets (Faryabi 2022).

Citrus exports in Türkiye first started in the 1950s but did not have a significant value until the 1970s. Since then, citrus exports to the former Eastern Bloc countries, which are currently the most important market for citrus fruits, have been an important step in this field. In this period, since both Türkiye and these countries did not have sufficient free foreign currency, trade was mostly carried out through the "Clearing" method (Güney, 2012). This is a slightly more developed form of barter. Importers in the countries signing the Clearing agreement pay the price of the goods they import in their national currencies to an institution such as the central bank or the Clearing office, which is assigned to keep the price of the goods they import in Clearing accounts in their own countries. The accounts are balanced at the end of the period with the accounts consisting of the money deposited by the importers of the other country to their own relevant institution. If there is a deficit, this deficit is closed with any convertible foreign currency agreed in advance (Küsmesz, 2016).

One of the most important items in the trade relationship between Türkiye and the European Union is the fresh fruit and vegetable trade. In this context, some problems can be seen in fresh fruit and vegetable trade. Gürbüzler (2008) showed that the current problems in the export of fresh fruit and vegetable production are transportation, protectionism in the importing country, difference in product standards, difficulties in product promotion, bureaucratic problems in Türkiye, communication with the importing company, inspection problems, problems at customs, bureaucratic obstacles and lack of market analysis. In addition, in the same study, HACCP and GLOBALGAP standards, which are related to product safety and traceability of products, are among the most important issues sought by importing countries.

The problems experienced by the Turkish citrus export sector can be analysed in two aspects as internal and external problems. Intrinsic problems are the lack of stable markets with reliable importers, the lack of effective intermediaries or institutions, the inability to create product diversification, and the low level of technology use, so that it cannot benefit from the cost advantages that can be obtained with technology. External problems include high costs of transport and packaging, inappropriate quality standards and payment failures, especially in Ukraine, Russia and some Eastern European importers (Zenginoğlu and Djik, 2006). Various policies are applied in the citrus trade relationship with the European Union, Türkiye's other major trading partner. These policies can be classified as product standards, producer organisations and branch associations, enterprise funds and programmes, intervention regulations and recalls. In some of the comments and opinions on the comparison of the Turkish citrus sector with the EU citrus sector, it is stated that the amount of refunds applied for citrus exports is too high. However, although these refund amounts are low, it can be stated that the aids and supports applied by the EU in the citrus sector from production to export are made at every stage and in a wide variety of directions and that these supports have a great share in the visible positive results (Zenginoğlu, 2007).

Table 7. TOWS Matrix (Source: Wehrich, 1982)

	Weaknesses	Strengths
Threats	Weaknesses – Threats (W – T)	Strengths – Threat (S – T)
Opportunities	Weaknesses – Opportunities (W – O)	Strengths – Opportunities (S – O)

In this context, orange and mandarin exports are carried out within the scope of the European Union Commission Implementing Regulation 2019/1793 and the Model Certificate Issuance Procedure for Fresh Fruit and Vegetable Exports to European Union Countries (Anonymous 6). In addition to these, mandarin trade with the United Kingdom is carried out with the criteria determined by the Food Standards Agency based on European Union practices. According to these criteria, some pesticides known to be harmful to human health are banned and their residues cannot be found in the products. The measure of the amount of heredity in the product is expressed as MRL (Maximum Residue Level). The amount of residue can only be found within the limits permitted by the European Commission (Anonymous 7, Anonymous 8). Products exceeding these limits are either destroyed or returned.

In this framework, when the Rapid Alert System for Food and Feed (RASFF) notifications given by the member countries are analysed, it is seen that the chemicals that are banned according to the regulations and criteria and have the most residue problems are prochloraz, fentimidat oksit, esfenvalerat, chlorpirifos metil (Anonymous 8). Although these active substances are authorised in the Plant Protection Database, their use in mandarin may cause problems in exports. The first of these problems is whether these active ingredients are authorised for mandarin or not. It is forbidden to use pesticides that are not licensed for mandarin. In addition, the pesticides licensed for mandarin are also evaluated within certain residue values.

Apart from residues, aflatoxins, the other undesirable substance subject to RASFF notifications, are included in mycotoxins in taxonomy. They are mycotoxins that can be widely found in many foods including cereals, oilseeds, spices, meats, milk and dairy products and animal feeds. Foods and animal feeds can be contaminated with aflatoxins during product processing, storage and sale. Aflatoxin contamination levels may vary according to climatic, regional characteristics or food type (Yentür and Er, 2012). Consumption of aflatoxin-contaminated feeds adversely affects animal health and production. At the same time, consumption of meat, eggs and milk of these animals poses a danger to human health (Gowda et al. 2004).

RASFF notifications are published periodically every month by the European Union. These notifications are open to everyone. Thus, the member countries of the Union can see how many RASFF notifications have been received for the products they import from which country. This may indicate that countries can organise their own food safety policies according to the notifications from here. In this way, they can inspect the products they follow where they come from according to the notification results.

Table 7 shows the list of RASFF notifications made for all dry and fresh fruit and vegetable products coming from European Union countries by years. It can be said that the notified products were withdrawn from the market, recalled or destroyed or returned. Here, it can be concluded that “the company’s request is taken into consideration and the goods are sent back for reprocessing if the company wishes to do so”. If this is not possible, the products are destroyed by the competent authorities. The returned products can also be re-entered to Türkiye after the

necessary controls in accordance with the Law No. 5996 on Veterinary Services, Plant Health, Food and Feed of the Ministry of Agriculture and Forestry. Products in violation of this law are destroyed (Anonymous 9).

In the table, the high number of RASFF notifications from Bulgaria and Germany is noteworthy. The reason for this is that trucks loaded with products exported from Türkiye generally use the Bulgarian border while leaving the country. Kapıkule Border Gate has been one of the most important gates of Turkish foreign trade to Europe since the past years (Küçükaltan 2012). In addition, the large Turkish population in Germany also explains that Turkish products are very popular in the country and food trade with Türkiye may be high. In this context, it is considered that the increase in the number of RASFF notifications in 2021 is a result of increased food safety inspections due to the pandemic in the Bulgarian border and in Germany. Especially in Germany, market and company controls are carried out intensively. In the controls on aflatoxin and residues, products are recalled or destroyed.

Apart from this, inspections at the Greek border and RASFF notifications from there are also noteworthy. Although the Bulgarian border is mainly used for fresh fruit and vegetable exports, the Greek border also serves as an important gate for exports. In this context, especially dried fruit exports and other food products can be inspected from here. Therefore, RASFF notifications from Greece are mainly generated as a result of border controls.

In the notifications made by the European Union, aflatoxin content has been reported in products such as dried figs, dried grapes and dried apricots. Products contaminated with aflatoxin are detained and destroyed by the relevant authorities. When the RASFF notifications were analysed, it was determined that aflatoxin was predominantly found in the notifications made, especially in dried products, except for high MRL values or residues. In addition to dried fruit and vegetables, aflatoxin is a serious problem for walnuts, hazelnuts, pistachios, sesame seeds and processed products (halva, tahini, etc.). Especially in countries such as France, the Netherlands, Italy, Belgium and Switzerland, aflatoxin can be found in products during field inspections and in warehouse controls based on consumer notifications. In this context, it can be said that a significant portion of the RASFF notifications received outside Bulgaria and Greece, where active ingredient analyses are performed at the border, are based on aflatoxins. As a result of the fact that these notifications are open to all European Union countries, countries want to remove aflatoxins and other mycotoxins found in imported foods by tightening inspections on products entering through their borders. According to Trademap data, this is an important problem for Türkiye, which is the world’s largest hazelnut and dried fruit exporter country (Anonymous 10).

It can be said that countries such as Romania, Slovenia, Sweden and Denmark have recently increased their field inspections in line with their own food safety policies by following the current RASFF notifications. In this context, products with residue values above the permitted MRL values and aflatoxin-formed products are collected from the market and the return or destruction procedure is applied.

Table 8. 2019 – 2022 RASFF Notifications (Source: Anonymous 11)

2019				2020			
C	TNN	MN	PMN	C	TNN	MN	PMN
France	28			France	21		
Italy	34			Italy	11		
Bulgaria	84	5	5.95%	Bulgaria	149	22	14.77%
Norway	1			Norway	3		
Cyprus	1			Lüksemburg	1		
England	25			England	9		
Germany	79			Germany	61		
Poland	3			Poland	5		
Netherlands	15			Netherlands	15		
Slovakia	2			Slovakia	6	2	33.33%
Spain	3			Spain	7		
Belgium	7			Belgium	9		
Czechia	3			Czechia	2	1	50.00%
Denmark	6			Denmark	6		
Sweden	5			Sweden	7		
Finland	1			Finland	1		
Croatia	3			United Kingdom	8		
Austria	3			Austria	4		
Switzerland	2			Switzerland	7		
Greece	8			Greece	1		
Romania	2			Romania	6		
Lithuania	1			Lithuania	1		
Malta	1			Arnavutluk	2		
Hungary	1			Hungary	3		
Slovenia	7			Slovenia	3		
Estonia	0			Estonia	0		
Portugal	0			Portugal	0		
Ireland	0			Ireland	0		
Latvia	0			Latvia	0		
Total	325	5	1.54%	Total	348	25	7.18%
2021				2022			
C	TNN	MN	PMN	C	TNN	MN	PMN
France	16			France	25		
Italy	29			Italy	37		
Bulgaria	258	80	31.01%	Bulgaria	223	20	8.97%
Norway	4	1		Norway	2		
Cyprus	1			Cyprus	0		
England	0			England	0		
Germany	106	1	0.94%	Germany	71		
Poland	9	1	11.11%	Poland	16	2	12.50%
Netherlands	14			Netherlands	25		
Slovakia	3			Slovakia	6	2	33.33%
Spain	6			Spain	7		
Belgium	12			Belgium	18		
Czechia	0			Czechia	1		
Denmark	9			Denmark	3		
Sweden	3			Sweden	6		
Finland	2			Finland	2		
Croatia	12	2	16.67%	Croatia	5		
Austria	10	1	10.00%	Austria	9		
Switzerland	4			Switzerland	7		
Greece	9			Greece	16		
Romania	22	1	4.55%	Romania	22		
Lithuania	0			Lithuania	1		
Malta	1			Malta	1		
Hungary	3			Hungary	1		
Slovenia	15	2	13.33%	Slovenia	7		
Estonia	7			Estonia	0		
Portugal	0			Portugal	2		
Ireland	1			Ireland	2		
Latvia	5	1	20.00%	Latvia	3	1	33.33%
Total	561	90	16.04%	Total	518	25	4.83%

C: Country; TNN: Total Number of Notifications; MN: Mandarin Notifications; PMN: Percentage share of mandarin notifications compared to all notifications (%)

Table 9. Number of RASFF notifications by years and Türkiye's situation (Source: Anonymous 11)

	Total RASFF Notifications	RASFF Notifications Related to Mandarin Ratio (%)	Ratio (%)
2019	325	5	1.54
2020	347	25	7.20
2021	561	90	16.04
2022	518	25	4.83

Table 10. TOWS matrix and analysis

Weaknesses	Strengths
<ul style="list-style-type: none"> Poor traceability Russian Federation - as the main market Unconscious producer - engineer Not knowing systems such as GLOBALGAP, HACCP Inadequate residue controls Lack of standardisation Non-compliance of production with EU legislation Failure to adopt modern production techniques Inadequacies in storage and the impact on supply 	<ul style="list-style-type: none"> Geopolitical position Experiencing the four seasons The region's abundance of arable land ensures abundant production. Transport facilities
Threats	
<ul style="list-style-type: none"> Failure to keep traceability records Russian Federation, the largest trading partner of the Türkiye, may view trade with the EU negatively due to political situations. Yield losses due to failure to switch to modern production Low value of the product due to problems in standardisation Excessive number of RASFF notifications and therefore spoilage of products not received due to residues Excessive proliferation of unwanted pests 	
Weaknesses – Threats (W – T)	Strengths – Threats (S – T)
<ul style="list-style-type: none"> Necessary measures should be taken to ensure correct traceability An alternative to the Russian market should be created by developing trade with the European Union countries. Elimination of inadequacies in mandarin storage and restructuring of warehousing activities in accordance with EU legislation. Producer and engineer awareness should be raised and modern production techniques should be made widespread, yield should be increased, and the proliferation of unwanted pests should be prevented Residue controls should be increased and carried out correctly within the legislation. The number of RASFF notifications should be reduced. Standards should be brought in line with EU norms and studies should be carried out on this subject GLOBALGAP - HACCP standards should be generalised. Production must comply with EU legislation and be an example. Importance should be given to storage activities against aflatoxin production 	<ul style="list-style-type: none"> Despite its geopolitical location and ease of transport, this advantage should be prevented from not being utilised in marketing. Modern production and storage facilities to take advantage of four-season production, with storage conditions in line with EU negotiations. Abundant production, coupled with adherence to the EU agricultural policy, has resulted in a significant increase in product prices. Reducing RASFF notifications and controlling pest reproduction will significantly improve production and transportation.
Opportunities	
<ul style="list-style-type: none"> Proximity to everywhere thanks to the location and the possibility to develop the market Continuity in production under favourable conditions Increased exports due to abundant production - Development of production through land, sea and air routes 	
Weaknesses – Opportunities (W – O)	Strengths – Opportunities (S – O)
<ul style="list-style-type: none"> Poor traceability hinders EU exports. Although production is continuous under favourable conditions due to unconscious producer - engineer, the value of the product produced decreases. Despite the high level of transport facilities, problems arise due to food safety. This situation prevents the utilisation of this advantage. 	<ul style="list-style-type: none"> Geopolitical and geographical location is a very important advantage in exporting to the EU. It provides convenience in export. The suitability of the seasons appears as continuity in mandarin production. Every season eliminates supply supply problems and increases earnings The development of land, sea and air routes enables the product to be shipped fresher.

When RASFF notifications are analysed by year, it is seen that there was a significant jump in 2021. In 2021, there were 90 RASFF notifications related to mandarin, all of which were related to residues and mycotoxin (aflatoxin). This number corresponds to 16,04% of the total RASFF notifications in 2021.

As can be seen from the figure, there is a serious jump in 2021. This jump is considered to be due to increased food safety inspections due to the COVID - 19 pandemic. In addition, the increase in the country's export potential in recent years and more products being sent to the European Union may have increased the number of notifications in direct proportion. In 2022, the number of notifications decreased. In this regard, the effect of the calls of exporters' associations, awareness-raising activities and tightening of controls throughout the country can be mentioned.

The TOWS analysis created in this context is given in Table 8. According to this table, which shows the Dry and Fresh Fruit and Vegetable Trade between the European Union and Türkiye in plain terms, it is essential to formulate some strategies.

In the light of the TOWS analysis given above, the strengths of Türkiye's mandarin exports to the European Union are as follows.

- Türkiye's geopolitical position and its proximity to the European Union countries
- Four seasons in the country and the possibility of continuous production
- Ease of transport of the produced product
- The region's abundance of arable land ensures abundant production.
- In the light of the same analysis, weaknesses are given as follows.
- Weakness of traceability activities
- Russian Federation – as main sales market
- Lack of knowledge of producers and people guiding producers
- Systems such as HACCP, Global GAP are not widespread
- Inadequate residue controls
- Lack of standardisation
- Problems in the application of modern agricultural techniques
- Storage and packaging problems. Aflatoxin formation. Threats are given as follows;
- Failure to keep traceability records
- Russian Federation, the largest trading partner of the Türkiye, may view trade with the EU negatively due to political situations.
- Yield losses due to failure to switch to modern production.
- Low value of the product due to problems in standardization.
- Excessive number of RASFF notifications and therefore spoilage of products not received due to residues.
- Excessive proliferation of unwanted pests.
- The aspects that can be seen as opportunities in the light of TOWS analysis are as follows.

- Proximity to everywhere thanks to the location and the possibility of market development
- Continuity in production under favourable conditions
- Increased exports due to abundant production
- Development of production through land, sea and air routes.

Conclusions and Recommendations

In this study, the effect of food safety criteria on Türkiye's dry and fresh fruit and vegetable exports to the European Union is analysed on the basis of mandarin sample. In this context, the concept of food safety has been analysed and a literature review has been conducted. On the axis of RASFF notifications made by the European Union, the trade of fruit and vegetable with the European Union has been analysed through food safety. In the light of the literature and legislation reviews, findings have been put forward and these findings have been subjected to TOWS analysis. After the strengths, weaknesses, opportunities and threats of the subject were revealed, they were matched and compared with each other. According to these data;

- Necessary measures should be taken to ensure that traceability activities are carried out correctly and appropriately. Traceability is a very important issue in European Union legislation. For this reason, recording procedures should be implemented meticulously.
- Despite the geopolitical location and the favourable climatic conditions for the production of mandarins, these advantages cannot be exploited. Therefore, the deficiencies in the storage of mandarins should be eliminated. Storage and production should be brought into line with European Union regulations.
- Producers and those who guide them should be made aware. Unconscious production leads to problems in food safety and standardisation. This leads to loss of value and other losses in the products produced. For this reason, producers and those who guide them should be raised awareness. Especially in exports to the European Union and the United Kingdom, it is essential to know the MRL (Residue) values and prohibited active substances and to comply with these values.
- It is important to use modern agricultural techniques in the production of mandarins. In the production of mandarins, it is important to select varieties appropriate to the region, to use the necessary amount of inputs in production and to avoid overuse, and to carry out production activities appropriate to the variety and the region. As technology changes, the aim should be to increase yield and quality with less input. For this reason, it is essential for producers to keep up with the changing world by adopting new pruning techniques and using more appropriate fertilisers and pesticides for the product.
- It is also essential to establish a traceability mechanism by recording these processes. Traceability is the recording of all stages of production in the light of the principle of traceability from field to fork. In this way, errors occurring during production are minimised. Full transparency is ensured. It is an

indispensable condition for mandarin trade with the EU. Therefore, it is essential for Türkiye to develop agricultural traceability activities.

- Unnecessary spraying and fertilisation in fruits and vegetables should be avoided in the light of the principle of from field to table. Producers should be made aware of this issue and production, especially in export areas, should be carried out under the control of expert engineers.
- Residue controls should be increased in accordance with the procedures. Products that cannot enter due to residue are subjected to treatments such as destruction or return. This situation causes problems in the value or shelf life of the product.
- Especially in dried fruits and vegetables, the aflatoxin problem is serious. In this context, importance should be given to the packaging and storage of products. In order to prevent the formation of aflatoxin, the legislation on packaging, storage and public supply established for the products must be strictly complied with.
- GLOBALGAP and HACCP standards should be disseminated and production should be compatible with European Union legislation. Compliance with these standards can also contribute to residue and standardisation problems. This may increase labour costs, but this is negligible compared to the increase in selling price and profitability due to the cleaner product.

In the summary of the analyses, it was observed that traceability and residue problems were quite high in vegetable and fruit exports to the European Union, especially mandarins. In this framework, it can be said that producers and those who direct them are unconscious about food safety, and the high number of RASFF notifications is a result of not paying attention to food safety. It is important to raise awareness of the producers that they should wait for the period between harvest and pesticide application and pay attention to storage conditions.

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