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The Monitoring and Analysis of Threats to Food Safety and Quality Events as Per Various Information Sources Using the Example of a Selected Group of Food Ingredients – Oils and Fats

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Abstract

The aim of the article was to synthesize and present to consumers the sources of obtaining information about health safety hazards and to raise consumer awareness of making responsible dietary choices. Assuring the safety and quality of food is binding on each and every participant in the chain of food supply as part of the 'farm to fork' concept. The analysis of notifications on potentially hazardous food products with regard to a selected group of food products, i.e., fats and oils is based on the data and information from the portals of the State Inspectorate of Agricultural and Food Quality Inspection, Main Sanitary Inspector, RASFF, and Probase360 service. Besides, additional information and opinions regarding the questions discussed are based on a review of literature by other authors. The chosen instance of major components of everyday diet, i.e., fats and oils, serves was to present the types and extent of information about the institutional supervision, which is made available to Polish consumers, inter alia. The diversity of published data is covered on notifications of and warnings against products harmful to health and life depending on the sources of information. Attention is drawn to the real risk to consumer health arising from the diversification of sources and the scope of data. The analysis contained in our study showed that work should continue to standardise the food products inspection system with regard to the health and safety of consumers. Such actions will help to disseminate risk notifications published on the portals of competent institutions.

Keywords: Food Safety, Food Adulteration, Consumer, Oils And Fats, RASFF.

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Introduction

Food safety has become a serious global problem with impacts on public health and international trade (Satcher, 2000). Food safety is full and universal where guaranteed in all its four dimensions, namely, physical availability, economic availability, quality of nutrition, and long-term stability of these three dimensions (Pérez-Escamilla and Segall-Corrêa, 2008, Poczta-Wajda, 2018). L. Silver and M. Bassett (2008) point out food safety in the 21st century should go beyond an improved nutritional profile to include access to unequivocal information about ingredients and regulations concerning unhealthy food. Fung et al. (2018) mention the issue of a continuing adaptation of legal regulations to keep them in step with technological progress.

The issue of following legal regulations with a view to assuring the general well-being of the public and the prevention of diseases carried by food is also highlighted by Silver and Bassett (2008). Gizaw (2019) claims the effective national systems of food inspection based on risk analysis would provide for an effective protection of health and safety of the population. As noted by Brock et al. (2003), the forms of risk assessment in food quality and the associated decision-making have evolved over the years to become different in various regions of the world.

The recent months have affirmed the pandemic caused by the SARS-CoV-2 virus is one of the challenges that contribute to changes in trade policies and the introduction of more restrictions and verifications of risk assessment with regard to food safety in international trade. This, and other pandemic situations may limit further globalisation of the food market (Kerr, 2020). According to Rizou et al. (2020), the development of instruments capable of detecting and analysing possible virus transfers across the chain of food supply is the key action in the present circumstances. Beia et al. (2020) have additionally proven an epidemic threat provides opportunities for fraud in connection, for instance, with untrue product labelling information or the absence of adequate product documentation.

An outline of the eu legal regulations concerning the assurance of food safety and quality

The assurance of safe food is a priority of food quality policy pursued, among others, by the European Union countries and defined in the food legislation (Łazarowicz, 2014). The EU regulations of human and animal food laws are specified in the Regulation of the European Parliament and of the Council (EC) No. 178/2002 (Regulation (EC) No 178/2002). In its light, manufacturers and distributors bear a full responsibility for the quality of food that is safe to consumers. This regulation protects the consumer and, importantly, prevents illegal or deceptive practices: food adulteration and any other actions which are potentially misleading to consumers. Product adulteration is driven by intentional and premeditated actions oriented at economic profits (Spink and Moyer, 2011). Undesirable ingredients that might be used to adulterate a product impair its nutritional properties and are responsible for serious health risks like anaemia, paralysis, brain injury, gastrointestinal disorders, miscarriages, and carcinogenic effects (Ramesh et al., 2018; Bąk-Sypień et al. 2018). Where an allergen is not marked, an adulteration may cause an anaphylactic shock or even death of those allergic to a given ingredient (Sharma et al., 2017, Awasthi, et al. 2014). In order to secure the quality and safety of food products, potential safety risks must be determined and preventive actions implemented, which is possible by keeping track of information published on the portals of inspection authorities and other dedicated institutions (Kowalska et al., 2018).

The EU member states, in line with Article 4 Section 1 of the Regulation (EC) No. 625/2017 (Regulation (EC) No 625/2017), are bound to appoint one or more authorities for the purpose of official food inspection at the national level. This legal act also requires an efficient and effective coordination among all the authorities involved, as well as the consistency and effectiveness of all official measures in a given state. The Regulation also orders appointment of an authority charged with coordinating cooperation and contacts with the Commission and other member states. The law is to ensure correct application and enforcement of legislation concerning the agricultural and food chain in order to protect human health, inter alia (Regulation (EC) No 625/2017). In order to provide consumers with information about the quality and safety of food, the European Commission has established the RASFF (Rapid Alert System for Food and Feed) in the member states. As part of the system, the member states notify threats to food safety and quality in case of serious risks to consumers' health (European Commission, 2017). The operation of this system of managing information about official inspections and its parts is governed by the Commission Implementing Regulation (EU) 2019/1715 of 30 September 2019 (Commission Implementing Regulation (EU) 2019/1715). Lüth et al. (2019) believe the tools of supranational food safety threats information like the European human and animal food early warning system RASFF play an increasingly important role in consumer protection, especially with regard to the global chains of supply.

Research Metodology

In this study, secondary research was conducted, i.e., the analysis of the source data was applied. Considering the nature of the available source data, desk research method was used in the study. A goal-oriented compilation, analysis and processing of data from existing sources was carried out in this study. The sources of data for secondary research were a total of four information databases, including three of a formal nature - institutional monitoring (State Inspectorate of Agricultural and Food Quality Inspection, Main Sanitary Inspector, RASFF) and one commercial (Probase360 service).

Monitoring institutions food quality in Poland

In Poland, the food safety competences are shared by several institutions. Under the prevailing law, the official food inspection is exercised by:

- In respect of commercial food quality (*as par the Commercial Quality of Agricultural Food Products Act - organoleptic, physical, chemical, and microbiological properties of agricultural food products with regard to manufacturing technologies, size or weight, as well as the requirements resulting from methods of production, packaging, presentation, and marking that are not subject to sanitary, veterinary or phytosanitary requirements* (OJ 2001, No. 5, item 44): the Inspectorate of Agricultural and Food Quality Inspection (IJHARS) and Trade Inspection (IH),
- In respect of the health quality of food (*as per the Safety of Food and Nutrition Act – all of the features and criteria serving to characterise food with regard to its nutritional value, organoleptic quality, and safety for consumer health* (OJ No. 171, item 1225 as amended): State Sanitary Inspectorate (PIS) headed by the Main Sanitary Inspector (GIS), and Veterinary Inspectorate (IW).

The inspection institutions also include Plant Protection and Seeds Service (PIORiN) and Environmental Protection Inspectorate (limited to inspections of fertiliser application and storage). A lead institution is not named, however, which the Supreme Chamber of Control (NIK) believe does not foster the system's effectiveness (NIK, 2019).

The creation of a standard, integrated system of inspecting food safety and quality in Poland is consistent with the opinion and research of Maruszewska and Miśniakiewicz (2018), as well as the European Commission's recommendations for Poland (European Commission, 2019).

As indicated by Hadjigeorgiou et al. (2013), food safety is monitored by a single institution in most European countries. Poland follows the member states by undertaking legislative efforts to integrate its supervisory authorities (The Seym of the Republic of Poland, 2017). The Act Amending the Commercial Quality of Agricultural Food Products Act and Certain Other Acts of 23 January 2020 is part of the consolidation of food supervision authorities (OJ.2020.2021). It only merges the duties of two inspectorates, IH and IJHARS, while supervision over the commercial quality of agricultural food products is the competence of IJHARS.

The sources of information on food safety threats

Both consumers and food manufacturers can find information about the quality and safety of food in IT systems. We have decided to track and present the data supplied by the various IT systems at the national and EU levels as well well as by a commercial database using the example of some food product ingredients, namely, fats and oils.

The portals of the state supervision inspectorates

GIS

Polish consumers use publications on the portals of the national supervisory inspectorates, with GIS and IJHARS releases and reports as the key sources of information (Kozłowska-Burdziak, 2019). Both the website and the Twitter, Facebook or Instagram portals of the GIS are the sources of reliable and accessible knowledge and information based on research and supplied by the institution. If some food in the market or in consumers' possession is suspected as a health hazard, the GIS posts a public warning at its website's tab Warnings (GIS, 2021a). In 2020, the GIS published 74 warnings against both food and food contact materials (GIS,2021c). The GIS publishes its annual report 'The Sanitary State of the Nation' as well. The document provides consumers with information and as yet unpublished collective data about 'The sanitary state of food and catering organisations, materials and products for contact with food, and cosmetics' (GIS, 2021b). Some sample results of the official inspections of the health quality of foodstuffs and their selected group (vegetable fats) for the years 2011-2020, gathered from the annual GIS reports, are presented in Table1. The percentage share of questioned samples (which fail to meet the regulations) is illustrated with the example of the foodstuff category of vegetable fats. It should be noted this product group comprises the olive oil, a most common object of food fraud as reported by the International Food Standard (IFS, 2020).

Table 1: results of official GIS inspections in the field of food safety with special emphasis on vegetable fats from 2011 to 2020

Year	Total foodstuffs				Samples questioned [%] For a selected group of food saucers (vegetable fats)	
	Samples tested [units]		Samples questioned [%]			
	Total	National samples	Total	National samples	Total	National samples
2011	70 075	57 373	3,0	2,9	2,29	1,47
2012	67 665	55 426	4,02	3,95	2,61	2,14
2013	67 036	54 453	2,89	2,87	2,95	2,99
2014	69 779	56 584	2,96	3,14	3,68	2,27
2015	70 611	57 938	2,7	2,88	1,35	1,27
2016	80 369	68 671	2,87	2,93	1,51	1,19
2017	81 655	69 762	2,83	2,84	2,6	2,25
2018	81 938	69 290	3,03	3,17	0,89	0,7
2019	82 513	69 810	2,55	2,62	1,18	0,63
2020	58 883	50 527	3,09	3,36	1,60	1,07

Source: own work based on: GIS, 2021b.

The total number of test samples has risen over the years just through 2019 year, evidence of intensifying institutional inspections (Table 1). This also corroborates a continuing trend of the growing activity of the health quality supervisory authorities in Poland and a more intense monitoring of threats to consumer health. As far as the selected group of foodstuffs, i.e., vegetable fats, is concerned, a declining trend of both Polish and total disqualified samples can be observed on the basis of the GIS figures in Table 1, up to and including 2019. A comparison of the proportion of samples questioned (failing to meet legal regulations) in 2018 and 2019 indicates the quality of foodstuffs introduced to the Polish market improved for all the food categories, including the vegetable fats, too. In contrast, the quality of foodstuffs marketed in the country deteriorated slightly in 2020. It can be said in general the institutional supervision of foodstuff health quality in Poland brings measurable results, supporting consumers with making good dietary decisions. Via its National Contact Point (responsible for the communication between the European Commission and the official food inspection authorities), the GIS transfers dangerous food notifications in Poland to the RASFF network. Table 2 summarises the annual incidence of KPK GIS notifications to the RASFF system from Poland.

Table 2: structure of notifications submitted to the RASFF system by Poland (KPK GIS) in 2015-2020

Type of notification	Year					
	2015*	2016*	2017*	2018*	2019*	2020**
Alert	51	10	73	42	48	56
Informational, in order to take action	31	25	37	10	73	19
Informational, in order to draw attention	38	5	50	14		64
Rejection at border	6	34	1	65	82	47
Total	**126**	**74**	**161**	**131**	**203**	**186**

*Source: own work based on * GIS 2021b, ** RASFF 2021.*

The data reported by Poland to the Community system of rapid information sharing point to a growing trend of alerts (prompt action necessary) concerning the identifications of dangerous food (Table 2). The number of information notices (prompt action is not necessary) has been growing, too. These data confirm the efficiency of the national rapid alert system for unsafe food and feed. Therefore, it can be assumed that in the future the effectiveness of the institutional food safety surveillance system will be at a satisfactory level (Table 2).

JHARS

IJHARS proceedings and the results of their work are published in freely available registers (IJHARS, 2021a) and 'Wiedza i Jakość/ Knowledge and Quality' bulletin (IJHARS, 2021b) Table 3 summarises the types of data published by the institution using the example of the technological group: oils and fats as per the scopes of inspections (testing of physicochemical parameters, assessment of organoleptic features and of marking). The data in Table 3 concerning oils and fats suggest the percentage share of questioned batches began rising in 2015 for the physicochemical parameters and organoleptic features evaluated by IJHARS. It should be noted the proportion of nonconformities detected as part of organoleptic assessments was more than a half of IJHASR inspections of sensory characteristics. The share of oils and fats reached nearly a half (41.4%) of all the nonconformities detected in fats and oils in connection with incorrect physicochemical parameters (with direct impact on nutritional properties) in 2020. In turn, the results of marking evaluations fail to point to a clear or constant trend towards improvement in this area. The changes of the percentage shares of the particular parameter categories that result in a questioning of a product lot do signal more intensive preventive actions by the consumer health protection institutions.

Table 3: percentage of questioned batches from the oils and fats group in relation to total questioned batches as a result of IJHASR inspections by type of non-compliance from 2015 to 2020

Year	Product grup	Questioned batches due to verified parameters [%]		
		physicochemical	organoleptic	correctness of labelling
2015	Oils	7,3	-	17,2
2016	Olive oil Spreadable fats	6,7 3,4	-	40,0 19,4
2017	Vegetable oils	9,1	20,3	26,7
2018	Vegetable oils Spreadable fats	3,1 23,3	15,7 -	23,0 53,5
2019	Olive oil Spreadable fats	5,0 12,5	52,6 -	34,0 13,9
2020	Vegetable oils Spreadable fats	20,5 19,9	43,0 10,7	26,5 25,0

Source: own work based on: IJHARS, 2021a.

RASFF

The RASFF portal is another source of information about risks to food safety. The notifications to the RASFF from Poland are discussed in section 4.1.2. This part will be dedicated to the information that can be filtered out of the publicly available Internet service. As part of the activities of the national EU supervision authorities in 2020, a large number of notifications for the food of Polish origin was recorded, i.e., 354 (Figure 1), which places Poland third among the countries of origin where the safety and quality of food were questioned. Most notifications were recorded with reference to food from out of the EU, namely, India and Turkey. Germany is one of the most active reporters of food risks to RASFF, with 520 notifications and a relatively low number of notifications concerning food from Germany last year (RASFF, 2021).

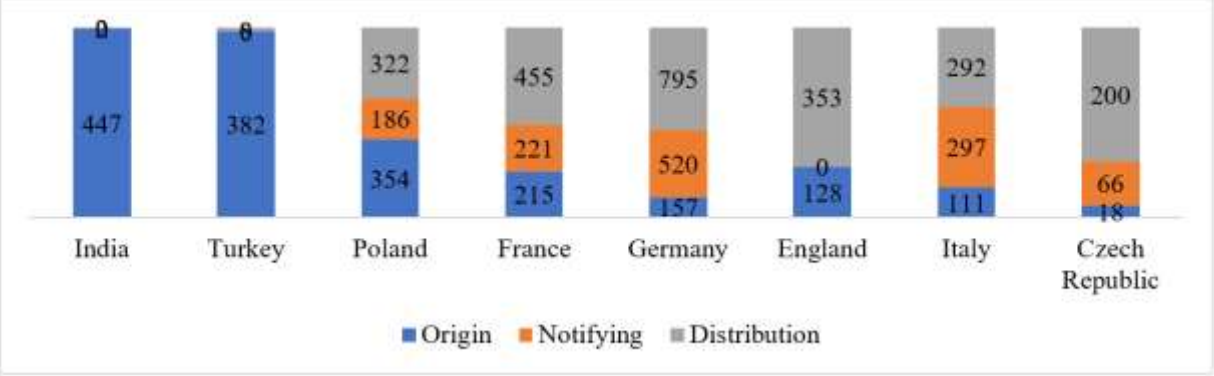

Fig 1. Poland's activity in the area of food safety notifications to RASFF in 2020 in comparison with other countries.

Source: own elaboration based on: RASFF, 2021.

The notifications related to the selected group of food, that is, fats and oils, are tracked in this paper (Figure 2). As far as their origin is concerned, most notifications of products hazardous to health were reported to the RASFF system by Germany and Italy, from where chiefly hemp oil and olive oil originate. Most RASFF notifications were recorded from Germany (8), twice fewer from Italy, and merely one from Poland.

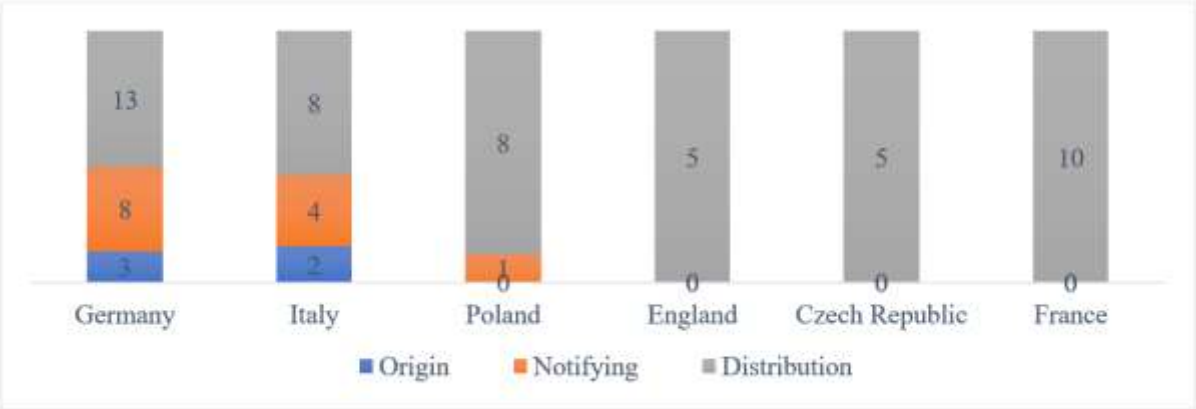

Fig 2. Characteristics of reported risks for fats and oils in selected countries in 2020
Source: own compilation based on: RASFF, 2021.

The presence of environmental impurities, i.e., admixtures of mineral oils and esters, are among the most common irregularities concerning oils and fats reported to RASFF. The fat composition, on the other hand, which directly contributes to the changes of nutritional properties, accounts for merely 13% of all the irregularities (Figure 3.)

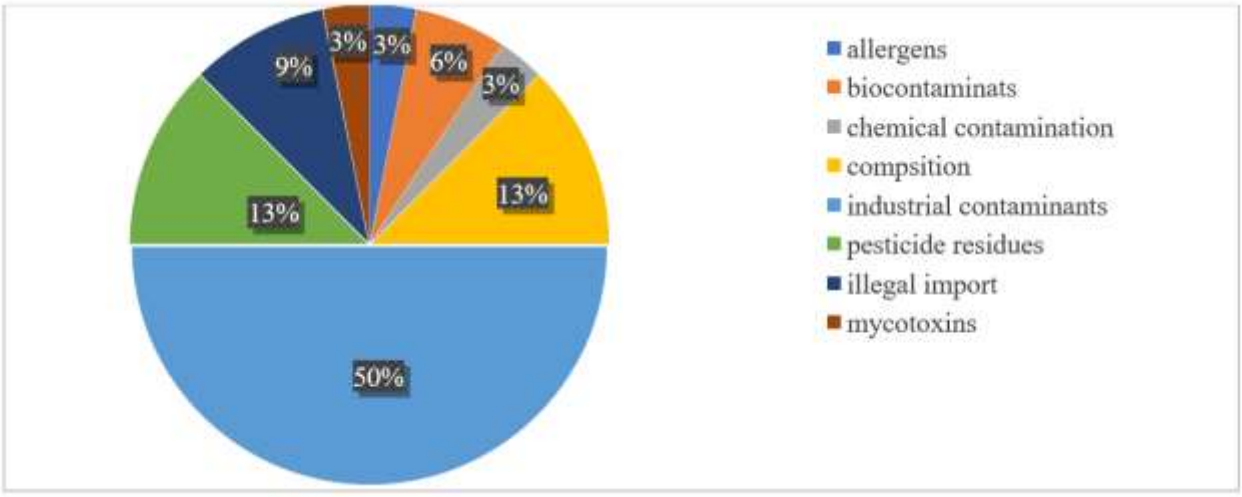

Fig 3. RASFF notifications in 2020 by type and prevalence of food hazards in the oils and fats group.
Source: own compilation based on: Probase, 2021.

The commercial database PROBASE360

Since both consumers and food manufacturers monitor food hazards, other than the recommended sources of information deserve to be mentioned, such as commercial databases tracking the quality of food, especially its adulterations,, e.g., Fraud Risk Assessment (2021) Safety HUD (2021), Probase360 (2021).The database available in the commercial market in Poland, namely, PROBASE 360 (established in particular to monitor the quality of food with regard to possible adulterations), compiles several sources of information, i.e., RASFF notifications, reports and withdrawals by national food safety supervision institutions, both Polish and foreign, the European Commission's reports (instituting the RASFF system), the Internet, and scientific publications.

Data have been reviewed from the Internet portals of the inspection authorities, RASFF notifications, and total other notifications in 2018-2020 (Figure 4). 264 notifications from the published reports of supervision authorities, 85 from the RASFF system, and 170 from the remaining sources were recorded in 2018. In 2019-2020, the number of reports concerning food adulterations from the inspection portals rose nearly three times and from other sources more than 1.5 times compared to 2018, whereas the number of notifications from RASFF was identical in 2020 and 15 higher in 2019 (Figure 5). These figures affirm a more intense activity of the state inspection authorities controlling food adulteration.

The notifications of oil and fat adulterations from the particular sources of information in 2018-2020 as recorded in the commercial database are shown in Figure 5. It must be said the numbers of notifications from the supervision authorities have continued to rise, remain steady in the RASFF system, and decline in the case of other sources.

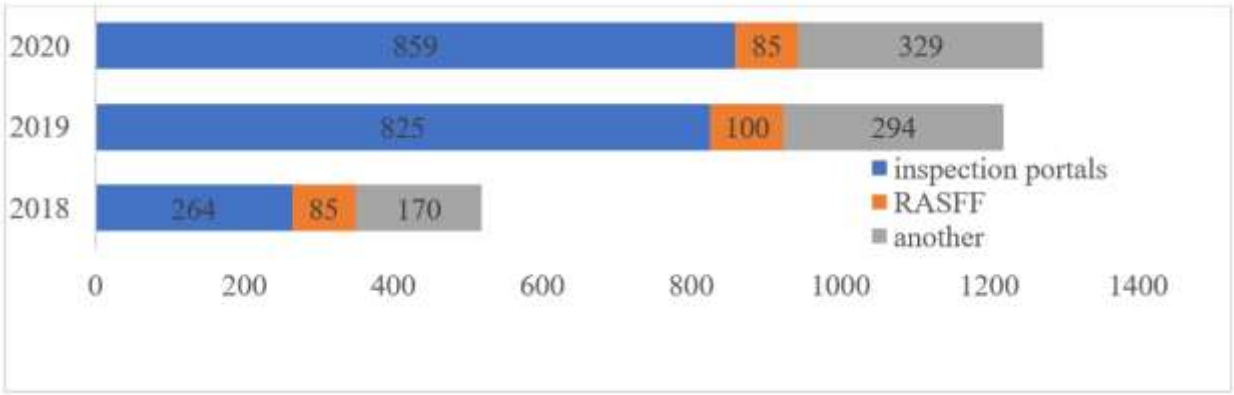

Fig 4. Food adulteration reports by source of information appearing in commercial database in 2018-2020
Source: own compilation based on: Probase, 2021.

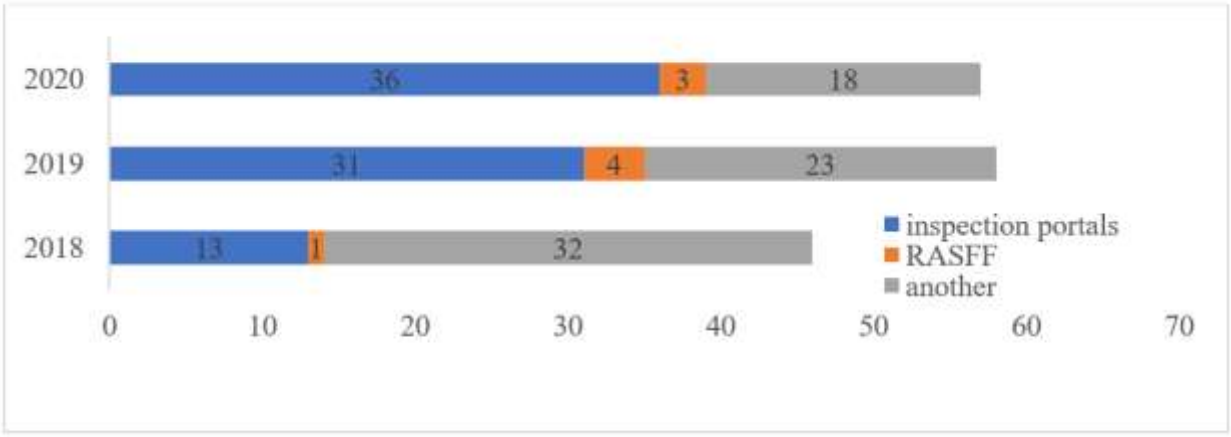

Fig 5. Characteristics of oil and fat adulteration reports by source of information in 2018-2020
Source: own compilation based on: Probase, 2021.

The notifications as filtered by the RASFF browser relate to the main ingredient responsible for the nutritional value of a product (36%), product names (33%), illegal trade (24%), and added ingredients (7%) (Fig. 6.)

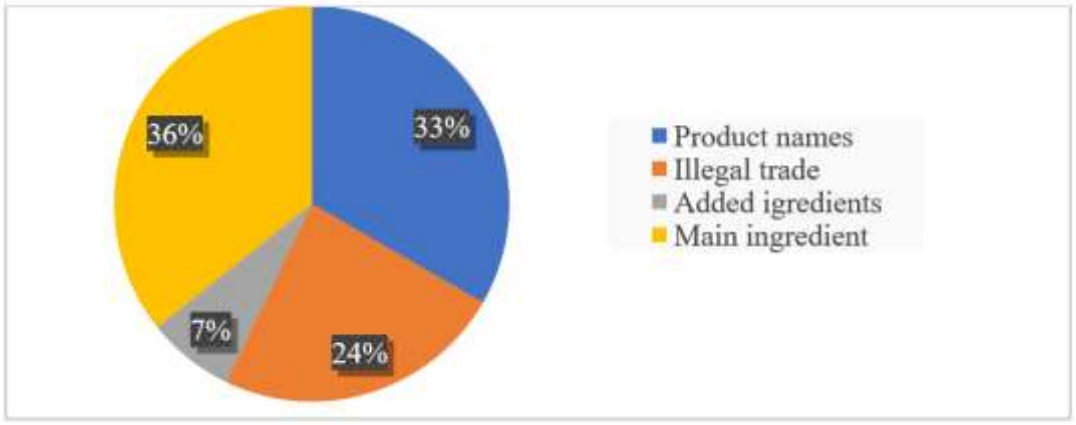

Fig 6. Adulteration risks in the oils and fats group relative to the adulterant in 2020 in the commercial database
Source: own compilation based on: Probase, 2021.

A comparison of information from RASFF and Probase 360 systems

To compare the information in the above databases of the two systems providing food safety information, notifications from both the portals are listed in Table 4. Three times more notifications are recorded in the RASFF portal than in the commercial base. The notifications concerning fats in RASFF accounted for 0.01% of food notifications (32). Probase 360 also cites the notifications recorded in RASFF (concerning fats), though only those listed by RASFF in the category: the source of risk: adulteration/authenticity of food, which coincides with fat adulteration notifications in the RASFF portal. The commercial database recorded nearly 10 times more notifications from other sources, i.e., results of national food quality inspections.

Table 4: Comparison of selected food safety parameters on RASFF portal and commercial database in 2020

Type of application	Portal RASFF[1]	Commercial Portal [2]
Total	3794	1273
Food	3233	1215
Fats total	32 (75*)	57
Fats adulteration	3	57

*Source: own work based on: [1:] RASFF, 2021, * European Commission, 2020, [2] Probase 360, 2021.*

Possible reasons for the divergences in the data are worth considering. Above all, no harmonised definition of food fraud is available at the EU level (Spink et al., 2019). This can be noted when filtering the data in the RASFF portal, where only notifications concerning economic safety are listed in the category of food adulteration/ authenticity (Beia et al., 2020), that is, illegal imports and their status (proven or merely suspected). RASFF also supplies information about the nonconformities of the required transborder food documentation, i.e., health certificate of a product and analytical reports on the following categories: lack of documents, incorrect documents, forged documents.

Since the category of food adulteration is defined in this manner on the RASFF portal, the remaining threats affecting the authenticity of food must be sought through the browser's other filters. For example, the presence of chemicals that shouldn't be found in a given group of foodstuffs, e.g., non-food pigments of Sudan I, II, IV types in fats and oils, are classified as technological additive hazards. The information in the RASFF Annual Report 2020 (European Commission, 2020), including harmonised data from that system and the ACC (Administrative Assistance and Cooperation System), referred to as iRASFF, is another inconsistency. The number of notifications about fat and oil adulteration in that document is 75, whereas there are 32 reports for this group that can be found by means of the RASFF system's browser (Table 4). The inconsistency between the data presented within a single system is thus substantial. The multiple-level classifications on the RASFF portal generate even more inconsistencies, namely, an underestimated number of notifications in the commercial databases that rely on the information from RASFF.

Conclusions

These authors believe potential consumers willing to monitor the food market for its quality and safety encounter certain difficulties. Despite a number of legal regulations and the establishment of formal IT systems dedicated to the quality and safety of food and designed to inform both food consumers and manufacturers about health risks, finding consistent information appears difficult.

The emergence of commercial portals attempting to systematise the public releases concerning food quality still fails to produce standard data. The divergent definitions, classifications, and filter nomenclature serving to search for desired notifications may further confuse users. It is therefore necessary to continue efforts at standardising the nomenclature, ordering the categories of notifications and releases both on the inspections of competent national authorities and from other sources of information. Such actions are difficult yet, we believe, reasonable and, above all, useful in obtaining information about safe food.

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