Chapter

Aflatoxins in Mozambican Online Mainstream Press

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Abstract

Aflatoxins gained increased recognition in Mozambique due to their negative impact on health, food security, and trade. Most contamination occurs in peanuts, maize, and their products. Nevertheless, there is little awareness, probably because the press and mass media do not disseminate enough information. This study analyzed the quantity and quality of information on aflatoxins in Mozambique's leading online newspapers between 2009 and 2018. After analyzing articles using Atlas.ti, the information was synthesized and compared to scholarly sources. Mozambique requires more press and media coverage of aflatoxin research and development activities. Awareness campaigns should be reinforced, distribute information to multiple organizations, and use multiple means, including online mainstream press, spreading information to reach a broad range of people, given the diversity of cultures and villages' remoteness. Organizations providing information, including universities, need to translate the highly technical information published in scientific journals to help reporters understand the research's implications. Furthermore, there is a need to identify groups that do not receive messages from current campaigns and appropriate methods for reaching those populations.

Keywords: aflatoxin, awareness, online, newspapers, Mozambique

1. Introduction

In July 2005, experts from the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) created a workgroup to design strategies to minimize aflatoxin exposure in developing countries [1]. They proposed combining activities, some ongoing, grouped into three major categories: preparedness, surveillance, and response. The first category includes education materials and awareness promotion, which shows how important information is to prevent outbreaks of aflatoxicosis. Furthermore, communication favors smooth coordination between the different sectors involved in the mitigation of aflatoxins.

Aflatoxigenic *Aspergillus* spp. are endemic in Mozambique [2]. Aflatoxins have been found in local groundnuts [3], several other commodities [4], and even in chicken giblets [5]. Aflatoxins caused a 2004 outbreak in Eastern Kenya [6–8]. Also, an influential study correlated aflatoxin exposure and hepatocellular carcinoma in southern Mozambique [9]. Thus, people have to be aware of their risk every day by consuming cereals and other grains. Nevertheless, such awareness seems low outside academic circles and even among some scholars [4]. There should be more effort to disseminate information on aflatoxins in Mozambique [10].

One could argue that nowadays, there is enough scholarly information on aflatoxins in Mozambique, covering aspects such as how widely spread they are, the volume of research, or what to do to control them. There is some truth in that [3–5, 10–12]. However, it is essential to consider that: (1) most scholarly literature is written in English, but the average Mozambican citizen barely understands this language; (2) most Mozambicans have low educational degrees, and they can hardly understand technical terms frequent in academic publications; (3) access to such publications is limited; and (4) it is necessary awareness on aflatoxin to search for information about them in the first place.

The advent of inexpensive online resources and information technologies is unquestionably providing access to information at an unprecedented scale in volume and novelty. Such access is critical in developing countries, where many people can hardly afford printed sources regularly. Mozambique is not an exception, as people actively use mobile phones and other platforms to access online newspapers [13–15]. It will not be surprising if some studies demonstrate wider consumption of online press concerning the printed counterpart. According to Chichava and Pohlmann [16], the social impact of the internet in Mozambique as a source of information increased exponentially. Such impact requires responsibility, and it is essential to know how much effort internet sources, particularly online newspapers, inform citizens in public health matters. This manuscript discusses how much the Mozambican online mainstream press contributes to disseminating citizens' awareness about aflatoxins. Articles related to aflatoxins from major online newspapers were selected and synthesized into a consistent theoretical knowledge body and then compared with scholarly literature.

2. Study area

Mozambique (**Figure 1**) is a tropical Southern African country in the region's eastern coastline (Indian Ocean). The country shares its border with Tanzania, Malawi (north), Zambia (northwest), Zimbabwe (west), South Africa, and Eswatini (southwest) [18]. The area is 801,590 $km^{2,}$ and the population 27,909,798 inhabitants, according to the 2017 census [19]. Approximately 68% of the population lives in rural areas [20].

The country's official language is Portuguese, but there are at least 23 local languages. The National Educational System (SNE) is almost entirely in Portuguese [21], with few exceptions, such as the international schools to accommodate international students and basic English and French studies in the secondary and higher education programs. Moreover, the government and the civil society also use Portuguese for all official affairs, including the mainstream press and media.

In Mozambique, the media, associated with Information and Communication Technologies (ICTs), play various roles in society. The Mozambican journalistic landscape includes press, radio, TV, the internet, a community media subsector, community radios and TVs, and the Community Multimedia Center (CMC) [22]. The internet is a significant driver of social change in Mozambique due to communication and information sources [23]. For instance, a daily newspaper costs approximately US $0.34, a price considerably high as the country had 48.4% of people under the poverty line (US $1.90) [24], which worsened after the subsequent economic crisis. Furthermore, the press hardly reaches rural areas, where mobile technologies are gaining stage. Thus, one must expect that rural communities are more reliant on online press than physical.

Another critical feature in Mozambique is its predominantly agricultural economy. Most people in Mozambique live in rural areas, and agriculture plays a crucial

Figure 1.
Location of Mozambique in Africa and the world. Source: Alvaro1984 18 [17], under public domain worldwide.

role in the Mozambican economy as a source of food for most of the population and a source of income for about 70% of the population [25]. Some cash crops are groundnuts and maize, both susceptible to aflatoxin contamination [4]. According to Abbas [26], food insecurity is more significant in rural areas compared to urban areas due to some factors that occur in cities such as (1) obtaining higher monetary income, (2) subsidized prices of essential goods, (3) greater availability of food due to imports, and (4) more diverse diets. With limited research output and capacity to screen food for aflatoxins, Mozambique should at least spread awareness. The online mainstream press and media are perhaps a good alternative for the highly costly traditional awareness campaigns.

2.1 Search strategy

On 11 June 2019, the term "*jornais online de Moçambique*" [Portuguese: online newspapers of Mozambique] was introduced on Google Search™, as **Figure 2** shows, and the resulting links were consulted. Ten consecutive pages of the search were analyzed, and sources matching this research's scope were included, regardless of how many would appear.

2.1.1 Inclusion criteria

The sources selected were websites belonging to significant publishing entities recognized in Mozambique as such. They could be non-Mozambican, but they had to be written in Portuguese or any national language and have traceable

Mozambican authors or sources, regardless if they were individual or corporate. Bilingual sources were acceptable as long as if at least one of the languages was among mother tongues recognized in the country. The articles included should mention aflatoxins.

2.1.2 Exclusion criteria

The search excluded non-press sites (e.g., streaming services, personal blogs, or social media), unreliable, sensationalist, or suspicious sources due to lack of elements of evidence traceability such as author's identity (corporate were included),

Figure 2.
Google search page showing results for "jornais online de Moçambique."

Year	Newspaper	Author	Title*
2009	*@Verdade*	@Verdade [27]	Laboratory starts tests with corn and beans
2009	*@Verdade*	@Verdade [28]	PMA helps to build 300 improved barns
2012	*@Verdade*	@Verdade [29]	After a strong draught, corn flow is changed in the US
2013	*Sapo Notícias*	Lusa [30]	Mozambique will produce biocontrol products to reduce toxins and post-harvest losses
2013	*Notícias*	Notícias [31]	Post-harvest losses: Mozambique starts producing biocontrol products
2015	*@Verdade*	@Verdade [32]	Approximately 420.000 people die yearly due to unhealthy food
2015	*Notícias*	Notícias [33]	Africa: Mozambican woman receives a scholarship for agricultural research
2017	*@Verdade*	Caldeira [34]	
2018	*Sapo Notícias*	Lusa [35]	US study aflatoxin exposure and undernutrition in Mozambique
2018	*Notícias*	Notícias [36]	Mozambique launches a study on aflatoxin and chronic undernutrition

**Titles are translated from Portuguese.*

Table 1.
List of online newspapers with publications mentioning aflatoxins in Mozambique.

year of publication, titles, name of the publisher and contact. Sites with unidentified sources or no evidence that the information was collected from Mozambican primary sources and article duplicates were also excluded.

2.2 Data extraction

Several websites matched the general search, but only 15 were considered online newspapers according to the criteria considered for this study. Among them, only 3 had articles mentioning aflatoxins and, again, fulfilling the criteria (**Table 1**). After that, the software Atlas.ti 8.1 was used to summarize the general information related to aflatoxins in the selected articles. Quotes were codified as etiology and contaminated food, epidemiology and susceptible groups, detection and control, impact, resources, and regulation. The information was reorganized and written as a coherent synthesis using the "code forest" tool.

It is essential to clarify that the synthesis is written for academic purposes. The way its information is organized does not correspond to the chronological order in which the newspaper contents were presented. Some reinterpretation was necessary for the sake of scientific rigor and coherence of the synthesis. Furthermore, the information was translated from Portuguese, implying that the language's idioms and other peculiarities were adapted for English-speaking readers. However, there was an effort to be as faithful as possible to the sources.

3. Synthesis

3.1 Etiology and sources of contamination

Filamentous molds of the genus *Aspergillus* produce aflatoxins when they grow in food [29, 31, 32, 34]. Aflatoxins can be found in foods like groundnuts, some varieties of maize [27, 34], in cassava [36], beans, and can also be found in cereals like sesame [28].

3.2 Geographical distribution and susceptible groups

According to Notícias [31], there are at least 10 African countries where aflatoxins are significant health and agricultural burden: Mozambique, Nigeria, Senegal, Uganda, South Sudan, Burkina Faso, Zambia, Tanzania, Rwanda, and Kenya. The same newspaper added that they all developed biocontrol products for toxigenic *Aspergillus*. The only Mozambican area reported on the online mainstream press was Nampula province [27].

The people most affected by aflatoxins are farmers, either directly consuming contaminated food or indirectly through a deficit in their sales. The market is becoming more demanding in terms of quality and safety [27, 30]. The toxins can also cause livestock losses [29].

3.3 Detection and control

Dr. Carla Menezes of the Faculty of Veterinary, Eduardo Mondlane University recommended the citizens to use organoleptic approaches to detect contaminated groundnuts [34] since Mozambique still lacks resources for routine analysis of aflatoxins.

The University of Lúrio (UniLúrio), in Nampula Province, has one laboratory for aflatoxin analyses in maize, beans, and other grains [27]. The World Food Program funded improved barns to local farmers to support production, and perhaps most samples now analyzed at UniLúrio come from the barns and are meant for export [28].

In 2013, Lusa [30] and Notícias [31] reported that Mozambique would start producing and commercializing biocontrol for aflatoxins in 2015. The same sources stated that each country has to develop its biocontrol products, as they are specific for the geographical area. The price is around US $10 per hectare [31].

3.4 Risk and impact

Aflatoxins are among the significant foodborne toxicants in the world [32]. However, a recent analysis based on maize at UniLúrio presented low contamination levels [27], suggesting that the toxins do not pose a significant risk for public health in Mozambique and this product. The newspaper, known as @Verdade [27], did not specify such levels. According to Dr. Charity Mutegi, researcher of the Institute of Agricultural Research in Kenya, aflatoxins' actual problem is the widespread lack of awareness among the population [30].

Chronic exposition to subcritical aflatoxin levels does not seem to be a significant concern. However, it increases hepatocellular carcinoma risk [30, 34, 35] and aggravates undernutrition by reducing nutrient absorption, consequently retarding fetal growth [30, 36]. Acute cases include liver damage such as necrosis, hepatic cirrhosis, or edema, sometimes with fatal consequences [30, 31].

Aflatoxins reduce the local market's safe food, compromises export, and such reduction devalues the farmers' efforts throughout Africa [30, 31]. For instance, in 2000, Malawi could not export peanuts to the European markets because the grains had levels above the limit required [31]. With the introduction of the biocontrol product, the farmers are expected to reduce post-harvest losses, thus increasing their income [30].

3.5 Resources

In 2018, Lusa [35] reported a joint study about the impact of aflatoxins on food security, conducted by the American Laboratory of Nutritional Innovation of the universities of Tufts and Georgia, and the Mozambican UniLúrio, National Institute of Health and the Association for Nutrition and Food Security. Notícias [36] added that the study was mainly conducted in Nampula City, but it also involved the districts of Angoche, Larde, Malema, Meconta, Mecuburi, Mogovolas, Moma, Monapo, Murrupula, and Rapale.

Very little was said about experts working directly with aflatoxins, although all examples mentioned so far about laboratories and other projects engaged in aflatoxin control [27, 30, 31, 35, 36] imply the involvement of multidisciplinary teams, probably including scholars, researchers, farmers, and possibly government administrative entities. Notícias [33] mentioned the scholarship "African Women in Agricultural Research and Development AWARD 2015", in which 70 scientists working on agriculture were selected to research on several subjects, including aflatoxins. The only expert directly mentioned was Charity Mutegi, from Kenya [31].

3.6 Levels and regulation

In Nampula, the World Food Program supports the farmers, but the organization demands the farmers to comply with international requirements to export their

maize, groundnuts, and other commodities [28]. Aflatoxin analyses are among such demands, and the results are sent abroad to the clients, who approve and purchase the products.

4. Discussion

The number of articles is minimal compared to how frequently these newspapers publish their issues and how long they have been publishing. Their presence in online platforms is recent compared to internationally well-known publications such as The Guardian or New York Times. However, it is hard to explain why the mainstream press barely mentions contaminants in Mozambique's main cash crops. More should be expected in an endemic area for toxigenic *Aspergillus* spp. and "hotspot" of aflatoxin exposure [4, 10]. When compiled, the information seems highly informative and perhaps enough for the ordinary citizen if one regularly reads all these sources. The attentive reader can find high-quality scientific information simplified in a very comprehensive fashion. However, we have to assume that the reader has to "connect the dots" every time he reads about *Aspergillus* spp. and aflatoxins.

4.1 Etiology and epidemiological considerations

The most crucial information about etiology and contamination is stated: what causes, which kind of organism it is, and some food where it can be found. They even emphasize groundnuts and maize (two sources mentioning them), which are, in fact, the essential sources as significant staple food and cash crops [4]. Foods like Cassava, beans, sesame, and other cereals have not received a significant concern. However, a survey carried in the country during the 1980s detected aflatoxins in the products mentioned and sorghum, most with levels at least above 4 μg/kg [37]. In this study, cassava flour (12 samples) presented an average aflatoxin level of 28 μg/kg and the median of 40 μg/kg. It should be a serious concern if the post-harvest techniques have not improved.

Regarding the geographical distribution, there is an acceptable degree of accuracy in regards to the countries mentioned are precisely the places where aflatoxins have been reported the most [38, 39], and it is understandable the lack of depth in the information considering the media and their priorities, directed to the general public. It likewise makes sense that Nampula (**Figure 3**) is the only area reported because most export groundnuts are produced there [4].

Nevertheless, it is somewhat misleading for the ordinary citizen because the person might think that aflatoxins occur only in that area. However, aflatoxins have also been found in several types of food from the southern area. There was indeed research by Van Rensburg et al. [32] demonstrating the relationship between aflatoxin exposure and hepatocellular carcinoma in their pioneering research. Furthermore, recent studies by Sineque et al. [5] and Hlashwayo [3] demonstrated that aflatoxins also occur in Maputo, including groundnuts. The evidence so far, and even the common sense, suggest that aflatoxins occur everywhere in Mozambique and the countries around [43]. In any case, Nampula might not be the only area where aflatoxins contaminate groundnuts. However, it still holds a higher significance, considering its relative volume of groundnut production.

The current Mozambican literature does not mention farmers as the primary group exposed to aflatoxins, as two recent reviews discussed [4, 11]. However, it can be deduced since they are the primary food handlers, in contact with the commodities from production until sale in the market, and sometimes they sell

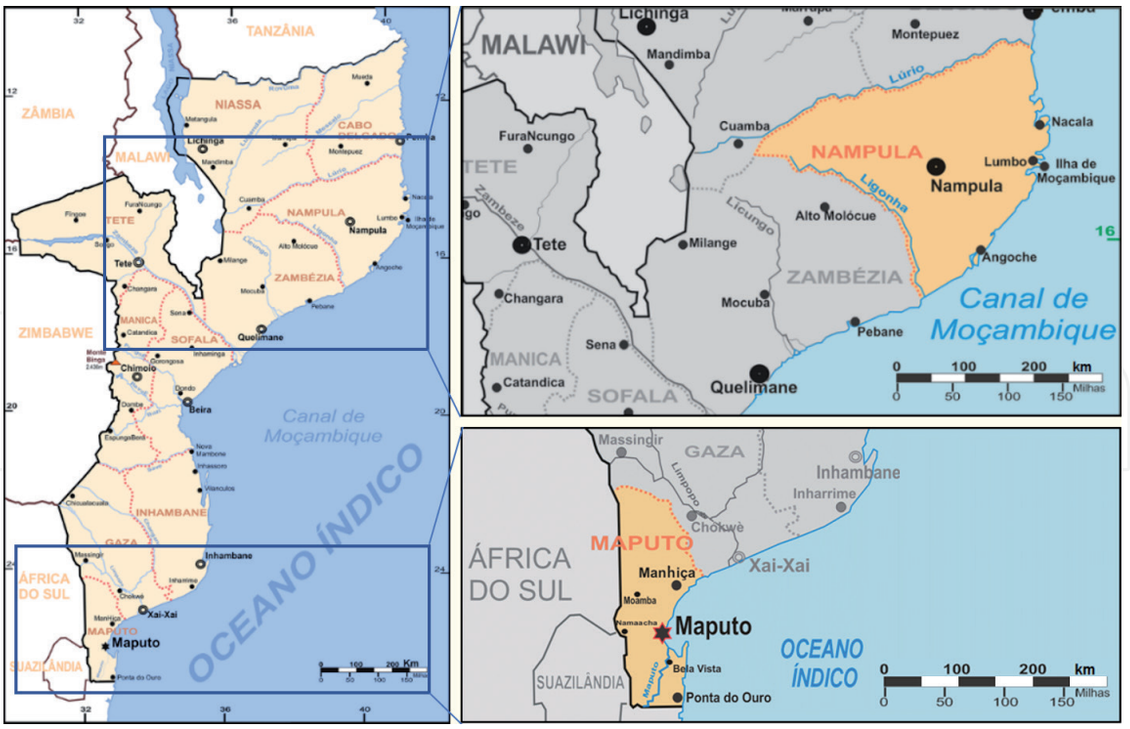

Figure 3.
Draft of the Mozambican map highlighting Nampula province and part of the southern area, where aflatoxin contamination in food has been reported. Adapted from Koehne [40], Koehne [41], and Koehne [42].

themselves. Furthermore, the market pressure for high quality and safe products, combined with maximized harnessing, leads the farmers to deliver their best product and keep the less safe for themselves or feed their livestock. Such a scenario results in a very high risk for their health and animal production. Indeed, aflatoxins' impact on husbandry cannot be underestimated, as the pioneering study of turkey X disease showed [44], followed by an overwhelming body of evidence [45].

4.2 Detection and control

Concerning detection, Dr. Carla Menezes stated in an article from the newspaper @Verdade [34] that the citizens could recognize aflatoxin-contaminated groundnuts when they present "that rancid taste" [in Portuguese]. Visual sorting of damaged grains can help reduce cases of extreme contamination, but Dr. Menezes' recommendation not scientifically sound for the following reasons: (1) there is no evidence that aflatoxins can be detected by testing food; (2) tasting food is not a right approach for toxicological analysis because it compromises the person's safety; (3) groundnut rancidity usually results from hydrolysis or autoxidation of fats into aldehydes and ketones [46, 47], and these processes do not require the presence of *Aspergillus*. However, people still need to avoid rancid groundnuts because they are indicators of spoilage and even safety issues. High moisture (for hydrolysis) and oxidation often result from exposure to water and air, and respectively such media can be sources of contamination or facilitate the process.

Another topic, still related to detection, is Mozambique's increased capacity to detect aflatoxins in food. The aflatoxin analysis laboratory is still the only one certified for aflatoxin analysis in the entire country. However, other laboratories can now perform aflatoxin analysis, and there have been efforts to improve the situation. Cambaza et al. [10] described a few other laboratories with capacity for aflatoxin analysis: National Laboratory for Water and Food Hygiene (LNHAA),

also certified, Directorate of Animal Sciences from the Mozambican Institute for Agricultural Research (IIAM), International Institute for Tropical Agriculture (IITA) and Tertiary Polytechnic Institute of Manica (ISPM). IIAM, together with Eduardo Mondlane University (UEM) and the Italian International Cooperation for Development, organized the Workshop for Food Quality Control and Laboratory Accreditation (WQCA) on 28 and 29 November 2019. There were representatives of companies that use quality control services, quality control providers, central laboratories, and technical support providers for accreditation. The Department of Chemistry of the Faculty of Sciences (UEM) also revealed their capacity for aflatoxin analysis, with methods including high-performance liquid chromatography (HPLC) and enzyme-linked immunoassay (ELISA), among others. However, none is accredited by the International Standardization Organization (ISO). Among the significant barriers for accreditation of methods in Mozambique there is a lack of financial means, little support from authorities, and lack of consistent regulation for food quality, safety, and nutrition.

There have been initiatives to control aflatoxins, especially in cash crops destined for foreign markets. The barns of the World Food Organization, reported by the newspaper @Verdade [28], is an example. Such initiatives aim to respond to increasing demands from influential entities such as the European Union. Most limits throughout the world are within the range of 4–20 μg/kg [10], and they do not seem likely to become less demanding in the future. Thus, the most reasonable option is the adoption of sustainable methods to control and mitigate the aflatoxins. Another aspect to consider, often overshadowed by the urge to improve export products, is Mozambique's public health. Indeed, this issue was raised during the WQCA. According to Cambaza et al. [11], early aflatoxin studies were focused on public health due to the internationally very influential study, conducted by Van Rensburg et al. [9] and published in 1985, demonstrating a strong association between aflatoxin intake and hepatocellular carcinoma, in large part based on data collected in southern Mozambique. After that, there was a minimal follow-up in the country, but aflatoxins remained nearly known as a significant public health issue for approximately 15 years until van Wyk et al. [48] drew attention to a new problem: South African companies were no longer purchasing groundnuts from Nampula province because the high aflatoxin content led Europeans to refuse the products. From that moment on, aflatoxin research became mostly motivated by the need to meet international standards rather than a public health issue. In any case, aflatoxin research intensified as a worldwide concern after the 2004 outbreak of aflatoxicosis in Kenya [6], both as a public health matter and a global trade issue. Since most newspapers are directed to the ordinary citizen, it is perhaps for them to prioritize the dissemination of information on aflatoxins related to public health.

Regarding the introduction of the biocontrol agent marketed as Aflasafe™, the coverage seems reasonable. Newspapers Lusa [30] and Notícias [31] covered the information somewhat, indicating the price, benefits, and where to find the product. Furthermore, the US Embassy website in Mozambique also published information about this product in English and Portuguese, making the information more accessible to ordinary citizens. However, very few Mozambican citizens are likely to visit the website, except to search for scholarships and opportunities. Even though there is no direct competition and the commercialization of Aflasafe™ could be technically considered a monopoly, it is a social business, and the benefits of the product to farmers outweigh the fact that these newspapers are freely advertising it in favor of IITA and the US Department of Agriculture (USDA), the investors. Indeed, the product should be further promoted, as it is currently sold in Nampula [49], but aflatoxins' problem is countrywide.

4.3 Risk and impact

The extent of aflatoxin's impact on health, economy, and society in Mozambique is unknown, although Cambaza et al. [10] considerably discussed the matter in their recent review. In any case, it seems understandable why there is very little information throughout the mainstream press. It is challenging even for scholars and researchers. Knowledge of the impact requires context-specific information about biological, socio-cultural, and economic variables, and these are different in rural and urban settings. However, the risk is quite well-known among academics, and the same principles are applicable worldwide, requiring only knowledge about acceptable food safety practices throughout the value chain. Local press agents can easily find information about the risk of aflatoxin contamination and its management, even at very comprehensive levels for the ordinary citizen. Thus, Dr. Charity Mutegi was right when she stated that lack of awareness is the major problem in Africa [30]. The authorities should encourage any activities facilitating the dissemination of knowledge about the risk of exposure to aflatoxins.

In one article, @Verdade [32] defined aflatoxins as major foodborne toxicants in the world. This sort of necessary explanation, perhaps slightly more elaborated, is essential and should be part of all newspapers' articles on Mozambique's toxins because there is very little awareness. People should be well aware of the risk, although the press should be careful not to cause panic. Indeed, the fear of panic is possibly among the reasons why aflatoxins have never been considerably mediatized in the country, but not disseminating such important information might lead to the risk of an ill-managed outbreak of acute aflatoxicosis, with people not even knowing about the cause or nature of the disease. Surprisingly, Mozambique shares several natural and cultural features with Kenya, but the 2004 outbreak in Eastern Kenya was bare to non-covered by the Mozambican press. In truth, acute aflatoxicosis cases might be quite common in Mozambique, but the primary symptoms, such as anorexia, malaise, fever, vomiting and abdominal pain [8] indicate several other more common diseases. Even resulting in jaundice and consequent death [6, 8] can result from well-known cases of hepatitis, some endemic, and as frequent in Mozambique [9]. Doctors need skills and tools for differential diagnoses, but this is still a challenge in developing countries.

The newspapers presented specific consequences of aflatoxin contamination in foods and intake [30, 34, 35], and they deserve praise for this reason. They even distinguished clearly features associated with chronic and acute cases in very realistic explanations. They are described in a very comprehensive way, yet using precisely the terminology that even experts would use to explain the general public. The association between aflatoxin intake and undernutrition is still under research in Mozambique, and it is a concern in neighboring countries like Zambia [50]. However, even this information was clearly explained in Notícias [36] newspaper. Furthermore, they described the farmers' socioeconomic consequences as the international market rejects their products. These are two sides of aflatoxin concern already discussed in the previous section (public health and trade issues), seemingly well-covered by the Mozambican online mainstream press.

4.4 Resources and regulation

Some online newspapers revealed synergies between Mozambican and foreign organizations for aflatoxin control, some implying large investments enough open laboratories [27], building barns [28], research [35], business [30, 31], and other initiatives. Indeed, in Mozambique, aflatoxins have been gaining interest from academia, researchers, and the industry. Cambaza et al. [11] identified the four

major driving forces of aflatoxin research: cancer studies, academic curiosity, international trade, and opportunities (or foreign incentives), the latter two more influential. Unfortunately, the major driving forces come from foreign sources, resulting in very little local control. During the Workshop for Food Quality Control and Laboratory Accreditation, Dr. Ricardo Velho, representative of INSITE (accreditation mediating firm), called for more active involvement of local leaders in the improvement of laboratories in order to properly respond to current challenges. One reason is the lack of a legal framework and a consistent strategy to address food safety issues. It results in clustered information distributed through sporadic, scarcely related reports, and the resulting low awareness outside academic circles [4], and sometimes within such circles. This would be a good point where newspapers could contribute substantially by spreading awareness and sensitizing authorities to take action. One has to understand that leaders have many issues to address, and the less aware they are about some problem, the less likely are they to take any adequate measure.

As it was already mentioned, the newspapers indirectly revealed specialists working on aflatoxin research and other sectors where they are relevant by mentioning organizations contributing to aflatoxin mitigation: Eduardo Mondlane University, UniLúrio and other institutions of tertiary education, the National Institute of Health, Association for Nutrition and Food Security and a few more. Institutions for tertiary education are critical because they annually increase the number of people with knowledge and skills for aflatoxin research. There is no doubt about personnel ready to research aflatoxins in Mozambique [9]. The only problem is the shortage of incentives. Local researchers doing remarkable work on aflatoxins include Anjos et al. [12], Sineque et al. [5], Hlashwayo [3], and others [4, 10, 11, 51]. Some researchers publish their monographs locally and end up not indexing their works in major international databases. Mozambique's major problem is the lack of science writers, people with interest and skills to approach researchers and scholars and comprehensively translate their information to the general public.

The only regulations affecting aflatoxins mentioned in the newspapers were international [28], and they were mentioned indirectly, with little detail. They mentioned the major commodities affected (groundnuts and maize) and how the World Food Program helps enforce such demands. They did not mention that such demands come from the European Union, the United States, other countries and are recommended by Codex Alimentarius [10]. However, this information might not be crucial for the general public, in part because most locals reach these markets through South African companies [48], and it means that farmers only need to deal with these firms' demands. It makes sense that local regulations are not mentioned in the newspapers because, so far, there are no specific Mozambican laws or standards for aflatoxins. This situation could be a good opportunity for the online mainstream press to raise the issue and influence the competent authorities to consider a bill to establish limits for aflatoxins in food. It seems inevitable soon if Mozambique is planning to continue exporting maize, groundnuts, and other grains.

5. Conclusion

Mozambique requires more press and media coverage of aflatoxin research. The most relevant features of aflatoxin sources, exposure, intake, control, and consequences seem covered, but the publications should be more frequent and widespread. First, farmers, the most affected people, have very restricted access to the internet. When they do, which are the odds of finding such sporadically published

information, assuming they are interested in the periodicals mentioned? The question remains, even if the core target readers are city dwellers concerned with food safety. To a certain extent, the lack of information on Mozambique's aflatoxin situation reflects its limited research. However, there is also little coordination between academia, researchers, industry, and the press. Because the number of students who graduated from tertiary education in 2016 alone was 18,244 [52] and that the great majority writes a research dissertation as a partial requirement for graduation, there is undoubtedly an abysmal disparity between the country's scientific production and the mediatization of the significant findings for the general public, regardless of how significant they are. Thus, scholars, businesspeople, researchers, and journalists should reach out to each other and start a harmonized effort to inform the general public about its scientific progress, significant findings, and events related to aflatoxin research and management.

Conflicts of interest

The authors declare no conflict of interest.

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