



Awareness of aflatoxin contamination by selected groundnut producers in Umguza district of Zimbabwe

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ABSTRACT

Aflatoxin is one of the harmful mycotoxins produced by a fungus species called *Aspergillus* with toxic effects to both animals and humans. Aflatoxin awareness should be considered from producers up to consumers to reduce contamination levels and economic losses in susceptible crops such as groundnuts. The level of awareness and demographic dynamics that affect awareness of aflatoxin contamination in groundnut producers was assessed using a structured questionnaire on groundnut farmers in Ward 16 of Umguza district located in Matebeleland North in Zimbabwe. Random sampling was then used to select 50 farmers which was approximately two thirds of groundnut producing farmers in the study area. Descriptive statistics and Chi-square test were used to determine distribution of socio-demographic variables and test for independence of association between the variables that were assessed. Majority of the interviewed farmers (70%) were aware of the occurrence of aflatoxins in groundnuts but 64% of them were not aware of its causes except the predisposing factors. Gender, level of education and years of experience in growing groundnuts were significantly associated to the level of awareness on aflatoxin contamination in groundnuts. The levels of awareness in the study area are satisfactory and it is recommended that the methods of information dissemination be maintained or even up-scaled. More socioeconomic factors associated with awareness need to be assessed in future research work.

Key words: Aflatoxin, *Aspergillus*, mycotoxin, Zimbabwe

RÉSUMÉ

L'aflatoxine est l'une des mycotoxines nocives produites par une espèce de champignon appelée *Aspergillus* avec des effets toxiques pour les animaux et les humains. La sensibilisation à l'aflatoxine doit être prise en compte depuis les producteurs jusqu'aux consommateurs pour réduire les niveaux de contamination et les pertes économiques dans les cultures sensibles telles que les arachides. Le niveau de sensibilisation et les dynamiques démographiques qui influencent la sensibilisation à la contamination par l'aflatoxine chez les producteurs d'arachides ont été évalués à l'aide d'un questionnaire structuré auprès des agriculteurs d'arachides du Ward 16 du district d'Umguza situé au Matebeleland Nord au Zimbabwe. Un échantillonnage aléatoire a ensuite été utilisé pour sélectionner 50 agriculteurs, soit environ les deux tiers des producteurs d'arachides de la zone d'étude. Des statistiques descriptives et un test du chi carré

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ont été utilisés pour déterminer la distribution des variables socio-démographiques et tester l'indépendance de l'association entre les variables évaluées. La majorité des agriculteurs interrogés (70%) étaient conscients de la présence d'aflatoxines dans les arachides, mais 64% d'entre eux ne connaissaient pas ses causes, excepté les facteurs prédisposants. Le genre, le niveau d'éducation et les années d'expérience dans la culture des arachides étaient significativement associés au niveau de sensibilisation à la contamination par l'aflatoxine dans les arachides. Les niveaux de sensibilisation dans la zone d'étude sont satisfaisants et il est recommandé que les méthodes de diffusion de l'information soient maintenues ou même renforcées. D'autres facteurs socio-économiques associés à la sensibilisation doivent être évalués dans les travaux de recherche futurs.

Mots clés : Aflatoxine, *Aspergillus*, mycotoxine, Zimbabwe

Introduction

Aflatoxin is one of the harmful but often ignored mycotoxin produced by a fungus species called *Aspergillus* (Achaglinkame *et al.*, 2017). High levels have been recorded in cereal, legume, tuber crops and their associated products in sub Saharan Africa (SSA) (Nakavuma *et al.*, 2020). Groundnut is undoubtedly the leading legume produced by resource poor communities in SSA whose usability and value is threatened by aflatoxin contamination. Given the importance of groundnuts in the nutrition of these communities and livelihoods of various players in its value chain an important constraint such as aflatoxin cannot be ignored anymore.

Huge economic losses in groundnuts are encountered by both producers, traders, processors and consumers due to aflatoxin contamination even at very low levels (Ncube *et al.*, 2021). Aflatoxin is also a serious concern in the public health sector due to its reported toxicity, carcinogenic, mutagenic and teratogenic effects in humans and animals (Bbosa *et al.*, 2013). Aflatoxin contamination in groundnuts poses health and economic risk to the value chain actors (Dube and Mtetwa, 2015). Therefore, aflatoxin contamination can be regarded as a socioeconomic issue that warrants urgent and escalated attention. Moreover in Zimbabwe a country dominated by informal trading and agro-based industries, given the high risk of aflatoxin contamination reported in

groundnuts sampled from three major markets that sell groundnuts produced countrywide (Ncube *et al.*, 2021). Awareness is one of the key points of departure in addressing a socioeconomic problem of this magnitude. Aflatoxin awareness should be considered from producers up to consumers to reduce contamination levels (Tobin-west, 2018). Mitigation strategies without public knowledge and awareness would become difficult. Awareness of aflatoxin enables the communities to understand health and economic impacts associated with mycotoxins in activities of agricultural production. In the wake of these facts, empirical evidence from various research studies indicate that awareness levels in SSA on aflatoxin contamination in widely grown crops like maize and groundnuts and their products are still very low. In a study conducted by Dube and Mtetwa (2015) in Mutare in Zimbabwe, majority of the value chain actors in groundnuts had never heard about aflatoxins. Similarly in Tanzania 70-80% of the farmers had never heard about aflatoxin (Kamala *et al.*, 2016; Ayo *et al.*, 2018). 47% of the poultry farmers and 55.6% feed processors interviewed in a study done in Uganda were found to be unaware of the occurrence of aflatoxin in poultry feeds and its ingredients (Nakavuma *et al.*, 2020). However in some parts of the region like Congo high awareness levels of 85% of the interviewed farmers for maize, cassava and legumes were recorded (Udomkun *et al.*, 2018).

The socio-demographic determinants of awareness are quite dynamic (Shuaib *et al.*, 2012). Therefore, the aim of this study was to determine the level of awareness in one of the selected dominant agricultural areas in Zimbabwe and demographic factors that affect awareness of aflatoxin contamination in groundnut producers.

Materials and Methods

Study area, sampling procedure and data collection.

The study started with a formal questionnaire focusing on groundnut producing farmers in Ward 16 of Umguza district located in Matabeleland North of Zimbabwe. Farmers that grow groundnuts were purposively selected with the assistance of AGRITEX Extension officers who have the database of farmers in the area. Random sampling was then used to select 50 farmers which was approximately two thirds of groundnut producing farmers in the area. The questionnaire was pre-tested, adjusted accordingly to ascertain its reliability and was explained to the respondents in their local language which is Ndebele. After selection of 50 respondents who were responsible for the household's farm activity, face to face interviews were conducted using a short structured questionnaires. Each interview began with the introduction and explaining the aims of the study to the respondent. Thereafter, responses were recorded in English by the researcher, to determine awareness of farmers on aflatoxins in groundnuts.

Data analysis. Data was first captured in Excel Microsoft checked, cleaned and then exported to Statistical Package for Social Sciences (SPSS) version 16.0 software for analysis. Descriptive analysis was carried out to determine the distribution of the assessed socio-demographic variables and awareness across the variables in terms of frequencies. Chi-square test at 5% level of significance was done to test for independence of association between awareness on aflatoxin and each of the following categorical variables (gender, level of education and period of growing groundnuts).

Results and Discussion

Socio-demographic characteristics and awareness distribution on aflatoxin contamination of the interviewed farmers. The study revealed that among the interviewed farmers the study area had the highest number of females (80%) and (20%) males. Almost every participant had reached a certain level of formal education and majority had secondary education (54%), primary (42%) and however, (4%) had completed tertiary level. With regard to period of experience, 42% of the farmers had grown groundnuts for less than 5 years while 40% of the respondents had grown groundnuts for more than 15 years (Table 1).

Table 1. Descriptive statistics of the socio demographics and awareness distribution of the interviewed farmers

Parameter	Incidence %	Parameter	Incidence %
Socio-demographic variables			
Gender	20 80	Awareness on aflatoxin	
		Aflatoxin awareness	70 30
Education level	42 54 4	Knowledge on occurrence of aflatoxins in groundnuts	
		Yes	64
		No	6
Period of growing groundnuts	42 8 10 40	Knowledge on causative agent of aflatoxins	
		High moisture level	16
		Delayed harvesting	12
< 5years	8 10 40	Delayed drying	14
		Fungi	0
		Insect infestation	8
6-10years	10 40 32	Poor storage	14
		Don't know	4
		Not sure	32

The study revealed that of the 50 respondents, 35 (70%) knew about aflatoxin in the local language (ukukhunta), furthermore, 30% were unaware of aflatoxins. Therefore, of these 70% farmers, 64% (32 farmers) knew that aflatoxins can occur in groundnuts. However, 64% of the farmers perceived that high moisture content, delayed drying, delayed harvesting, poor storage and insect infestation caused aflatoxins, and none mentioned fungi as the causal agents. Respondents with less than 5 years of growing groundnuts (12%), those participants with experience between 6 and 10 years (6%), 11 and 15 years (8%) and those with more than 15 years of growing groundnuts (24 %) were aware of aflatoxin (Table 1).

Relationship of selected socio-demographic factors and awareness of aflatoxin in groundnuts.

The chi-square-test results on independence of association revealed that there was a significant association between gender and aflatoxin awareness, χ^2 (1, N = 50; 18; $p < 0.05$) (Table 2). Level of education and period in growing groundnuts were significantly χ^2 (1, N = 50; 20.44; $p < 0.05$) associated with aflatoxin awareness. The study found a significant relationship between experience in terms of number of years in growing groundnuts and awareness on aflatoxin contamination χ^2 (N = 50; 20.56; $p < 0.05$) (Table 2).

Discussion

Farmers in Umguza were found to be knowledgeable of aflatoxin in the current study most likely due to their close proximity to Bulawayo an urban area hence improved access and dissemination of information by media and extension workers. Females emerged to be aware about aflatoxins than men because they are responsible for post-harvest handling and with food safety (Magembe *et al.*, 2016). The findings of the current study are similar to those reported in Malawi where the level of awareness was high, 65%. Similarly, a study by Marechera and Ndwiga (2014) revealed a higher percentage (92.5%) of aflatoxin awareness in farmers in the lower Eastern Kenya. In a study by Gamocho (2004) farmers also mentioned that aflatoxin contamination increases in stored groundnuts until moisture content is low. Aflatoxin awareness was over 90% in the four states of Nigeria in which the majority of farmers had heard of Aflasafe (Johnson *et al.*, 2017). However studies in some parts of Uganda and Tanzania revealed that most of the farmers (>50%) that were interviewed were not aware of aflatoxin and its effects to both animal and human health (Magembe *et al.*, 2016; Nakavuma *et al.*, 2020). However, the current results contradict the findings of other studies from parts of Nigeria and Zimbabwe where the level of awareness observed was low (Idahor and Ogara, 2010; Dube and Mtetwa, 2015).

Table 2. Socio-demographic variables on knowledge and awareness knowledge about aflatoxin contamination in groundnut (n = 50)

Variables		Are you aware of aflatoxin contamination in groundnuts		χ^2
		Yes	No	
Gender	male	2 (4%)	8 (16%)	18.00
	Female	35 (70%)	5 (10%)	
Education level	primary	17 (54%)	4 (8%)	20.44
	secondary	16 (32%)	11 (22%)	
	tertiary	2 (4%)	0 (0%)	
Period of growing groundnuts	< 5years	6 (12%)	5 (10%)	20.56
	6-10years	3 (6%)	1(2%)	
	11-15years	4 (8%)	1 (2%)	
	> 15years	12 (24%)	8 (16%)	

Factors significantly associated at $P \leq 0.05$.

Most educated farmers can better relate to agricultural trainings and awareness campaigns conducted by extension officers and media (Adekonya, 2017), hence the observed relationship between the level of awareness and education in the current study. Udomkun (2018) observed that educated farmers in a study conducted on maize, cassava and legumes farmers in Congo were more knowledgeable about aflatoxins. Ayo *et al.*, (2018) also concurred that farmers' educational background and their interest cause variations in levels of aflatoxin awareness. Though knowledge of higher order like causative agents is likely to be acquired by people who have attained some tertiary education in Agriculture. In a different study health workers in Ghana knew about aflatoxin but none had told patients about consumption of aflatoxin contaminated food (Ilesanmi and Ilesanmi, 2011).

Conclusion and Recommendations

The present study to determine the level of awareness in ward 16, Umguza district of Zimbabwe and demographic factors that affect awareness of aflatoxin contamination in groundnut producers has shown that groundnut producing farmers were aware of aflatoxins. In general, farmers were aware of aflatoxin and the predisposing factors but not knowing that aflatoxins are caused by a fungi. Level of education, gender and period of growing groundnuts significantly affected the level of aflatoxin awareness on farmers. Methods of information dissemination used should be maintained if not up-scaled in order to maintain high levels of awareness noted in the area. More socio-economic factors that are associated with awareness need to be interrogated in future research studies.

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Declaration of No Conflict of Interest

The Authors declare No Conflict of Interest in this paper.

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