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Research Application Summary

Pre and post-harvest management practices of groundnut and their implication to aflatoxin management in Tigray, Ethiopia

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Abstract

In Ethiopia, groundnut is the second most important lowland oilseed after sesame, and has become an important high value crop grown in the dryland areas of the Tigray region, Northern Ethiopia. However its production is considerably low and its marketing is challenged by aflatoxin contamination. This study assessed pre and post-harvest management practices of groundnut in Tanqa-Abergele district, central zone of Tigray, Ethiopia and thier implication on aflatoxin management. A cross-sectional survey of 165 respondents and six key informants was conducted. Results showed that delayed harvesting, irrigation during harvesting and inadquate use of improved and disease resistant/ tolerant varieties were the common practices by groundnut farmers. These practices intensify moulding and subsequent aflatoxin contamination of the pods. Most farmers (65%) did not use proper drying, cleaning, storage and shelling methods leading to increased aflatoxin contamination. Promoting and distribution of improved varieties, training of farmers on the pre and post harvest management practices with regard to aflatoxins and create awareness on health risks to human and animals is paramount to improved groundnut production in Tigray region.

Key words: Aflatoxin contamination, dryland areas, Ethiopia, improved varieties

Résumé

En Éthiopie, l'arachide est la deuxième graine oléagineuse la plus importante après le sésame, et est devenue une culture de grande valeur, cultivée dans les zones arides de la région du Tigré, au nord de l'Éthiopie. Cependant, sa production est considérablement faible et sa commercialisation est remise en cause par la contamination par les aflatoxines. Cette étude a évalué les pratiques de gestion de la production d'arachide avant et après la récolte dans le district de Tanqa-Abergele, dans la zone centrale du Tigray, en Éthiopie, et ses implications sur la gestion des aflatoxines. Une enquête transversale auprès de 165 répondants et de six informateurs clés a été menée. Les résultats ont montré que la récolte tardive, l'irrigation pendant la récolte et l'utilisation inadéquate de variétés améliorées et résistantes/tolérantes aux maladies étaient les pratiques couramment utilisées par les producteurs d'arachide. Ces pratiques intensifient les infections des moisissures et la contamination subséquente par les

aflatoxines. La plupart des agriculteurs (65%) n'utilisaient pas de méthodes appropriées de séchage, de nettoyage, d'entreposage et d'égrenage, ce qui entraînait une contamination accrue de l'arachide par l'aflatoxine. Il est recommandé d'encourager et de distribuer des variétés améliorées, de former les agriculteurs, les agents et experts en développement sur les pratiques de gestion pré et post récolte et de les sensibiliser sur la contamination par les aflatoxines et sur leurs risques pour la santé humaine et animale afin d'améliorer la production d'arachide dans la région de Tigray en général et en particulier au Tanqa-Abergele.

Mots clés: Contamination par l'aflatoxine, zones sèches, Ethiopie, variétés améliorées

Introduction

Groundnut (*Arachis hypogaea* L.) is the second most important lowland oilseed after sesame in Ethiopia. It is mainly grown in eastern Harerghe, with immense potential in Gamogofa, Illubabor, West Gojam, North Shoa, North and south Wello, and East and West Wellega with average national yields of 1.4 t/ha^{-1} (Alemayehu *et al.*, 2014). The Oromiya region constitutes the largest groundnut producing area in Ethiopia accounting for 66% of the land area (CSA, 2014). Groundnut production is however constrained by several biotic and abiotic factors including, among others, critical moisture stress especially during and after flowering, lack of farmer preferred varieties, lack of appropriate production and post harvest practices, and diseases (Alemayehu *et al*., 2014).

The lowland areas of Ethiopia have considerable potential for increased oil crop production, including groundnut. This has led to a total production of well over 110,000 tons (CSA, 2014). According to the CSA report 2014, a total of 80,000 ha of land was under groundnut production yoelding over 110,000 tons in the 2013/14 cropping season (CSA, 2014). The largest production was in Oromiya region accounting for 66% of the total area (52,921 ha), out of which more than half (28,909 ha) is found in east Harerghe. Benshangul-Gumuz is the second largest producer of groundnut with an area of 18,592 ha followed by Harar (2874 ha), Amhara (2,380 ha), SNNPR (377 ha), and Amhara (345 ha). Currently the crop is becoming one of the high value crops that are growing in the dry land areas of the Tigray region specifically in Merebleke and Tanqa Abergel (central Tigray) and Tahtay Adyabo (Western Tigray).Given the widespread occurrence and prevalent conditions favoring aflatoxin contamination in groundnuts in the region , the present study aimed at understanding the existing production system of the crop (pre and post harvest) and awareness of farmers'as well as implication for aflatoxin management in Tanqua-Abergele, Tigray.

Methodology

The field survey was conducted in Tanqua-Abergele district, located in the central zone of Tigray, Northern Ethiopia (Figure 1) in the 2015/2016 cropping season. The district is one of the major groundnut growing areas in Tigray region situated at

a latitude of 13029' N and longitude of 38041'E and at an elevation range between 938-2201 meters above sea level (m.a.s.l). Agro-ecologically, the study area is categorized as lowland with average annual rainfall from 400-650mm and an average temperatures from 21- 41^{0}C. The major cropping season begins in late June and ends in September.

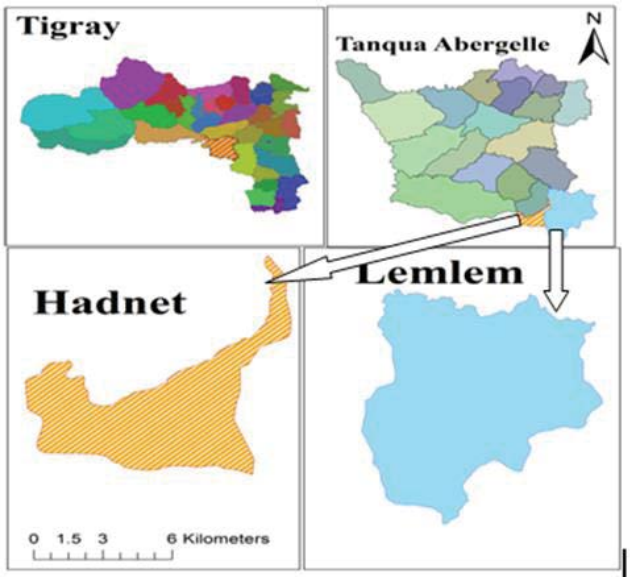

Figure 1: Map of Tanqua-Abergele district

Sampling procedure, sources of information. To gather the required data needed to meet the objectives of the study, four major techniques were employed in the study: household survey, key informant interviews, personal observation and secondary data.

A multi-stage sampling procedure was used in Tanqua-Abergele woreda. The area was selected purposively for two reasons, i) the woreda is one of the leading groundnut growing area in the region and ii) it is a project area of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) supported groundnut project. Based on information from Tanqua Abergel woreda office of agriculture, two important kebelles (smallest adminstrative unit of Ethiopia) based on groundnut production were identified, and subsquently based on the list of farm households obtained from the respective offices of the kebelles, a total of 165 smallholder farmers were randomly selected in proportion to the population of selected kebelles.

Information was collected on soil fertility maintenance, soil and water conservation, water harvesting, weeding times, crop rotation, crop protection, farming experience, harvesting, drying, cleaning, storage structures, storing, shelling, damage during harvest and shelling, loss during harvest, observation of mouldy seed at storage, use of mouldy seed, observation of problems associated with using mouldy seed, and method of controlling development of mould seed. Descriptive analysis was used.

A "2-way t- test" was employed to test for significant differences that could emerge from responses of the individual producers and other types of data collected from the interviews related to pre-harvest and post-harvest handling of the groundnut. Additonally a Chi-square test was also used to analyze the data from pre-harvest, post-harvest management and to explore their implication on aflatoxin management.

Result and discussions

Land preparation, maintenance of soil fertility, conservation of moisture, seed selection, sowing on time, weeding and crop rotation were all common practices in the area. Out of these practices, 88% of the respondents reported that they weed their groundnut fields at least twice; 99% of the respondents practiced crop rotation and 72% were applying manure and inorganic fertilizer as a soil fertility management strategy. Such practices normally have a positive effect on increasing soil fertility, enhancing productivity and in minimizing the crop infestation by *Aspergillus* fungus that cause aflatoxin contamination. On the contrary, 99% of the farmers in the district were dependent on one variety type implying low use of improved groundnuts varieties. This could be a contributing factor to the low productivity in the area and possibly enhanced contamination by aflatoxin.

Harvesting, drying, cleaning, transporting, storing, management of pest and disease at storage and shelling were the post harvest management practices commonly used by the farmers in the study area. Irrigation prior to harvesting to ease uprooting and delayed harvesting (practiced by 34% of the respondents) are among aflatoxin disposing factors used by farmers. Prediposition was by increasing pods/seed moisture and increased drying times. These practices lead to high aflatoxin infestation and also seed sprouting. Delayed harvesting of groundnut has been reported as one of the major reasons for post-harvest aflatoxin contamination in India (Kumar *et al*., 2005). In addition inappropriate drying, cleaning, storage and shelling materials practiced in the study area facilitated mold development and increased *Aspergillus* infection and subsequent contamination of groundnut with aflatoxin.

Poor curing practice was also common among the farmers and, is likely to induce fungal growth. Invariably this reduces groundnut seed quality for consumption, marketing and germination for the subsquent season's planting (Edriss, 2003).

The other common post harvest problems were shortage of storage space, shortage of labor for critical operations and various pests and diseases. Most respondents highlighted storage as the key post harevest problem in Tabia hadnet (66%) and Lemlem (63%). Other problems included labor shortages,were reported by 12% of respondents in Tabia hadnet and 25% in Lemlem. In addition 22% of respondents in Tabia hadnet and 12% in Lemlem, reported pest and disease problems. These results show that post harvest problems are very high, causing reduced quality and quantity of groundnuts, increased damage by pest and diseases invariably increasing contamination of groundnut with Aflatoxin.

In the study area, up to 85% of respondents had never heard the word aflatoxin contamination and were not aware of management practice needed to combat aflatoxin burden. Similarly farmers were not aware of the effect of Aflatoxin contamination on humans and animals. The few (15%)who had heard of aflatoxin contamination and management practice, reported diarrhea and coughing as illnesses associated with the consumption of aflatoxin contaminated groundnuts. Acute illness is the result of consuming foods contaminated with very high levels of aflatoxin. People die because of jaundice and liver failure. This result shows that most farmers in the area were not aware about aflatoxin contamination and management practice. Farmers who were aware of aflatoxin seemed to have had exposure through extension from training at Mekelle University, relief society of Tigray, and agricultural office (from experts and development agents) and from informal discussion with other farmers but had no detailed information on the aflatoxin.

Conclusion and recommendation

The study shows that farmers in Tigray have limitted awareness about aflatoxin and its management. Most groundut management practices in Tigray region some of which predispose the crop and kernels to aflatoxin contamination. There is therefore a need to create awareness about aflatoxins and possible management strategies among smallholder farmers, farmers association and extension agents in the Tigray region.

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