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Aflatoxin infestation in groundnut as influenced by different storage methods in Northern Ghana

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Introduction

About 90% of the world groundnut crop is produced in developing countries including Ghana and 67% of this quantity produced is used for oil. This therefore makes groundnut the second most important source of vegetable oil after soyabean.

In Ghana, groundnut which is also known as peanut remains the most popular and widely cultivated legume because of its adaptation to the climatic conditions, economic value as well as limited field pest problems. As a good source of food and oil, groundnut also provides adequate amount of protein, fat and carbohydrates for both human and livestock.

Despite its importance, groundnut (peanut) yield of 800 kg/ha obtained in Ghana is low compared to more than 3,000kg/ha in some of the developed countries such as United States of America. Among the conditions negatively affecting the yields of groundnut in Ghana apart from the low genetic potential of most of the varieties, are late harvesting of the crop and poor handling practices including storage methods.

It has been observed that groundnut harvested is always stored in several structures made out of wood, mud, jute and polythene which if not appropriate can expose the crop to insect and aflatoxin infestations which further lower the yields. The quality of groundnut after harvest is also reduced due to insect and disease infestation in storage which further reduces groundnut yield

In order to determine the best method/structure to store groundnut that will reduce the chances of aflatoxin and other infestations by insects, KDC found it necessary to assemble all known methods or structures currently practiced by farmers in the study districts. These were then used to store the crop for 6 months including the scientifically proven method such as use of triple bagging.

Objective

The objective of this study was to determine and select the method/structure of groundnut storage that would reduce aflatoxin infestation to the generally acceptable levels in groundnuts after some months of storage for adoption by farmers.

Methodology

Half an acre of groundnut was cultivated by a lead farmer in each of the 4-district following all the recommended Good Agronomic Practices (GAP) till harvesting and storage. All the good post harvesting practices were also adhered to during and after harvesting of the crop.

A focus group discussion was held with all stakeholders in each of the districts which included the groundnut farmers, sellers and other traders to assemble the storage structures used for groundnut storage in each district. This trial involved one lead farmer in each district.

Procedure before storage and determination of aflatoxin levels in groundnut

The harvested groundnut was sorted out by selecting only whole and non-damaged pods for the storage trial. After sorting out and before storage, a total of 3 kg weight of groundnut was each taken and stored in each of the common storage structures selected at each of the sites. The farmers finally considered only 4 as storage structures because they felt the rest were no longer being used by farmers and these were:

1. Clay pot (Commonly used)
2. Garnorma Improved Crop Storage sacks (GICSS)- made up of 2 inner nylon sacks in a polythene sack.
3. Single Polythene sack
4. Jute sack

All harvested and graded groundnut was dried to a moisture content of 12% before storage and before the initial determination of aflatoxin levels. At each of the 2-study sites where the trial was finally implemented (Nabdam and West Mamprusi sites), a composite sample of 1.5 g of the shelled groundnuts were taken to determine the aflatoxin levels before the groundnuts were even shared and stored in each of the storage structures mentioned above in November 2021.

These samples were left in storage from November 10th 2021 till June 10th 2022. These number of months were chosen for storage period because generally, these are the periods farmers store the crop after harvesting. And six months after harvest the period the crop can be removed from storage for planting and for sale at a relatively higher price.

Another set of samples of 1.5g of groundnut were taken from each storage structure from the two sites after the six months of storage and determined for Aflatoxin levels.

Results and Discussions

In comparing the initial levels of aflatoxin in groundnut with the levels determined after 6 months of storage of the crop, it was observed that aflatoxin levels in each of the samples taken from each of the structures had reduced significantly (Table 1).

Table 1: Aflatoxin levels in groundnuts before and after storage in 3 different storage structures

District	Storage structure	Initial Aflatoxin levels(ppb)	Final aflatoxin levels (ppb)
Nabdam	Composite sample	5.6	
	Clay pot		3.7
	GICSS		0 (LoQ)
	Single polythene sack		0 (LoQ)
W. Mamprusi	Composite sample	3.7	
	Clay pot		1.2
	GICSS		0 (LoQ)
	Single jute sack		0 (LoQ)

Some of the values of the final levels of aflatoxin in groundnut were even reduced below the limit of quantification (LoQ) suggesting that all the structures used are capable of reducing the aflatoxin infestation in groundnut in storage.

However, among the 4 storage structures (Clay pot, GICSS, single polythene sack and the jute sack), the clay pot appeared to be less efficient in reducing aflatoxin infestation compared to the rest. It is only the groundnut samples taken from the clay pots that gave values of aflatoxin levels higher than zero (0) but these values were also lower than the initial values determined before storage.

From the preliminary results, it can be concluded that apart from the clay pots, using single, GICSS as well as single jute sack to store unshelled groundnuts are efficient enough to reduce aflatoxin levels to below limit of quantification.

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