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Aflatoxin Contamination of *Arachis hypogaea* (Groundnuts) in Lagos Area of Nigeria

A. E. Thomas,[1] H. A. B. Coker,[1] O. A. Odukoya,[2] G. K. Isamah,[3] A. Adepoju-Bello[1]

[1] Department of Pharmaceutical Chemistry, School of Pharmacy, College of Medicine, University of Lagos, Idi-Araba, Lagos, Nigeria
[2] Department of Pharmacognosy, School of Pharmacy, College of Medicine, University of Lagos, Idi-Araba, Lagos, Nigeria
[3] Department of Biochemistry, Delta State University, Abraka, Delta State, Nigeria

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Human populations are exposed to aflatoxins as a result of the consumption of commodities (particularly grains and nuts) that have been directly contaminated by the aflatoxin producing strains of *Aspergillus flavus* and *Aspergillus parasiticus* during growth, harvest or storage (Busby and Wogan 1984).

The occurrence and magnitude of aflatoxins contamination varies also with geographical and seasonal factors. Crops in tropical and subtropical areas are more susceptible to contamination than those in temperate regions, since optimal conditions for toxin formation are prevalent in areas with high humidity and temperature (Diener and Davis 1969).

Grains and food stuffs capable of being contaminated with aflatoxins have been reported by Busby and Wogan and the level of contamination can vary from less than 1ppb to over 12ppb. In Nigeria, grains like groundnuts (*Arachis hypogaea*) have become a staple food among the populace and there is need to consider the sporadic nature of the infestation of these nuts.

In this study, the level of aflatoxin contamination of groundnuts (roasted, steamed and raw), was evaluated, using ultraviolet-visible spectrophotometric and high performance liquid chromatographic methods.

MATERIALS AND METHODS.

Roasted, steamed (boiled) and raw groundnuts were obtained separately from different locations within Lagos State of Nigeria. The groundnuts samples for this study were weighed (2Kg each), well ground at high speed for 10 minutes in 100g batches into fine powder form with an electric blender. 3 replicas of each was made. All the reagents used were the best available and were of analytical grade.

The extraction method of Hetmanski and Scudamore (1989) was adopted. This involved mixing 50g of the portion of the well-mixed, finely ground samples with 200ml of a mixture of water and dichloromethane (1:10) in 250ml flask. Mechanical shaking was applied for 30 minutes. This was filtered and the residue was rinsed with 3 portions of dichloromethane. The combined filtrate was evaporated to dryness and reconstituted with 5ml of

Correspondence to: O. A. Odukoya

dichloromethane. 2.5ml of hexane was added and made up to 10ml volume with dichloromethane. The extract was cleaned-up by adsorption chromatography whereby the column was packed with silica gel and alumina. The eluting solvents (dichloromethane and hexane) passed through the column and eluent was collected. This was concentrated to dryness and reconstituted with acetonitrile and water.

Spectrophotometric determination of aflatoxin was carried out with a modified method of Scott (1990). UV absorption was read at 360nm against acetonitrile and water as blank and the concentration calculated from the calibration procedure of Scott (1990).

A modified method of Rainer et al. (1993) was used for the analysis of aflatoxin. The aflatoxin extract was reconstituted in acetonitrile: water (1:1) mixture. Peaks were quantified using peak height by reference to a set of standards, diluting if necessary with (1:1) acetonitrile: water.

The mean and standard error of mean (SEM) were analyzed according to the procedure outlined by Bailey (1981). For statistical analysis, comparisons were made with student "t" test and the level of statistical significance was set at $P<0.05$.

Table 1. Total aflatoxin content (ppm) of peanuts by spectrophotometry.

Peanuts	Total Aflatoxin in *D/W Extract $\pm$ SEM
Roasted	23.29 ± 0.10
Boiled	30.74 ± 0.04
Raw	42.24 ± 0.09

*D/W = Dichloromethane/Water (10:1)
Results are expressed as mean and standard error of mean of 3 samples.

RESULTS AND DISCUSSION.

Cereals such as peanuts, groundnuts, have been universally acclaimed as harbingers of aflatoxins. The aflatoxin level in the samples has been shown in Tables 1 and 2. It should be noted that these values were determined on groundnuts that were yet to be graded. The raw groundnuts showed highest aflatoxin level. Roasted groundnuts, are usually soaked in salt water overnight before roasting and this may result in some degree of extraction of some of the aflatoxins. Soaking encouraged fungal growth. Boiled groundnuts showed level between that of raw and roasted.

Thus it could be seen that the high contamination values obtained is a cause for concern

Table 2. Total aflatoxin content (ppm) of peanuts by high performance liquid chromatography.

Peanuts	Total Aflatoxin ± SEM	
	**M/W Extract	***A/W Extract
Roasted	61.24 ± 0.67	47.04 ± 0.42
Boiled	54.83 ± 0.51	53.76 ± 0.27
Raw	62.16 ± 0.83	64.52 ± 0.65

**M/W = Methanol/Water (3:1) ***A/W = Acetonitrile/Water (3:1)

considering the fact that the aflatoxin action level stipulated by theFDA of the USA is 20 parts per billion (ppb) as indicated by Cole and Dorner 1994 while values as high as 30 parts per million (ppm) have been reported in some countries like Kenya (Peers and Linsell 1973). These high values reflect the fact that conditions in the tropics tend to encourage the fungal proliferation, such conditions as high humidity, high temperature as well as poor storage facilities have been strongly implicated.

Investigations in Nigeria have suggested the possible availability of mycotoxins especially aflatoxins in many food items (Nwokolo and Okonkwo 1978). It is possible that the consumption of such aflatoxin contaminated products is responsible for the presence of this toxin in the body fluids of individuals in Africa (Onyemelukwe and Ogbadu 1981; Ibeh et al. 1994).

From our experiments, it can be deduced that roasting of groundnuts reduces but does not eliminate aflatoxin contamination and cooking of food may not cause aflatoxin destruction. It is recommended that exposure of the general population to the aflatoxin contamination in the food should not exceed the guidance values given by health authorities.

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