

Determination Of The Aflatoxin Levels In Palm Oil Sold In Oil Mill Market, Port Harcourt

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Abstract: *The Oil Mill Market in Port Harcourt is a large market where buyers from other markets within and outside Rivers State get their supplies. This study takes a look at the aflatoxin concentration of the palm oil sold in this market. The study examined twenty palm oil samples, determining both their moisture content and aflatoxin level. The study shows all samples examined were contaminated with aflatoxin with three of the samples having aflatoxin levels above NAFDAC's permissible limit of 4ng/g. Twenty percent (20%) of the samples had water content above NAFDAC's permissible limit of 0.29%. The highest aflatoxin level was 6.87 ng/g while the highest moisture content was 2.50%.*

I. INTRODUCTION

In February 2014, the Nigeria Export Promotion Council (NEPC) raised an alarm that a large quantity of the country's foods exported to European countries are being rejected due to high presence of aflatoxin (Peoples Daily, 2014). There are no reports that these rejections no longer exist. According to the Council, within a period of 10 years (2003-2013), agricultural produce like melon, groundnut, palm oil, beans and ogbono (Irving Gabonensis) witnessed a high level of aflatoxin.

Aflatoxins are naturally occurring toxins that are produced by species of a fungus called *Aspergillus*. The toxins are produced as *secondary metabolites* by the fungi in temperatures range between 24 and 35°C, within many commodities whenever the moisture content exceeds 7% (Mukherjee, 2013). Many cereals, oilseeds and nuts are, in general, subject to fungal attack both in preharvest and postharvest periods (Eduardo, 2011). Fearfully, the principal target organ for aflatoxins is the liver. The World Health Organization has regarded aflatoxin as a Class 1 carcinogen. In fact, 40% of liver cancer in Africa has been attributed to aflatoxin (Mukherjee, 2013). Aflatoxins are a major group of mycotoxins, the four major types of which are B1, B2 (so-called because they show blue fluorescence under UV-light), G1, G2 (so-called because they show yellow-green

fluorescence under UV-light), and M1, M2 (so-called because they were first isolated from milk of lactating animals) (Kaaya et al, 2006). Aflatoxin B1 is the most frequently found in plant materials and has been implicated to be the most toxic and frequently detected form. The maximum allowable limit of B1 in foods is being controlled by regulating agencies all over the world. The legal limits may vary from one country to another, depending on the degree of development and economic consideration. In Nigeria, the aflatoxin allowable limit is 4ng/g, while in America it is 20ng/g (AATF, 2010).

An important part of the diet of many Nigerian homes is palm oil. Besides the vitamins and flavor it supplies, it is also a very important source of energy. The quality of palm oil is a function of many factors like weather, soil, harvesting condition, storage and process of extraction (Davie and Vincent, 1980). There are reports that palm oil has become the world's most important edible oil since 2006 (Frank et al, 2013). Unfortunately, palm oil is subject to deterioration, the consequence of which is harmful to health.

The quality of palm oil sold in many Nigerian markets has been a source of concern for many years. Olonrunfemi et al (2014) investigated the quality of palm oil sold in major markets in Ibadan, Oyo state. The results were not pleasant. According to the report, aflatoxin and moisture contents exceeded permissible limits, indicating that the quality of palm

oil in the sampled markets was poor. The study recommended the promotion of improved processing processes as well as good handling and storage practices. However, in the study to assess the quality of palm oil sold in major markets in Abia State, Udensi and Iroegbu (2007) showed that the quality of palm oil examined had properties that were within the standards recommended by SON and NIS. Although the paper did not investigate the aflatoxins content of the oils, the moisture content were well below the level that encourages the growth of molds. The results indicated that oils sold in Abia State were suitable for export. This could have been very conclusive if aflatoxins content were evaluated. In Port Harcourt, Oji et al (2015) assessed the quality of palm oil sold in selected markets. Physicochemical parameters like FFA and moisture content were above international standards. Aflatoxins content was not determined.

The purpose of this work is to determine the moisture and aflatoxin content of palm oil sold in the oil mill market in Port Harcourt. The oil mill market is a major market that attracts buyers and sellers from within and outside Rivers State every other week. Many other markets in Port Harcourt buy from this market. The aim is to ascertain whether aflatoxins exist in the oil samples sold in this market, which is a major source of other markets in Port Harcourt. In addition, fresh palm oil from a production points will be analyzed to determine the course of the presence or lack of aflatoxins in palm oil.

II. MATERIALS AND METHODS

A. MATERIALS

Twenty (20) oil samples of 250 ml each were collected from different shops in the oil mill market. This was done in September 2016. Codes were assigned to the samples using letters A to T.

B. DETERMINATION OF WATER CONTENT

The procedures from AOAC (2000) were followed in determining the moisture content of the samples using the oven dry method. Into previously weighed moisture dishes were poured 5g of samples. These dishes were then introduced into the Gallen Kamp oven and maintained at 65 °C until a constant weight was reached. The dishes were then cooled in a desiccator and a difference in weight obtained.

The percentage moisture content was determined from the relation:

$$\% \text{ moisture content} = \frac{X - Y}{Z} \times 100 \quad \dots(1)$$

Where X = weight of dish and sample before drying

Y = weight of dish and sample after drying

Z = weight of sample only.

All measurements were in unit of grams.

C. AFLATOXIN LEVEL DETERMINATION

The High Performance Liquid Chromatography (HPLC) method of analysis was used in determining aflatoxin level in the oil samples. This method was chosen because it is a very

precise and highly automated quantification technique for aflatoxins analysis with high selectivity and sensitivity (Hussain, 2013). The method employed was that of AOAC (2000).

$$\text{Aflatoxins B1 (ng/g)} = \frac{A}{B} \quad \dots(2)$$

Where A = aflatoxin injected into LC (ng)

B = equivalent weight of test portion injected into LC (g)

III. RESULTS AND DISCUSSION

Samples	Moisture Content (%)	Aflatoxin B1 (ng/g)
A	0.17	2.01
B	0.19	3.52
C	0.14	4.72
D	0.22	5.98
E	0.12	1.89
F	0.13	1.76
G	0.16	2.87
H	0.26	3.22
I	0.21	1.89
J	1.52	3.44
K	0.20	1.23
L	1.87	6.87
M	0.11	2.15
N	0.89	1.56
O	0.24	2.45
P	2.50	2.31
Q	0.21	2.45
R	0.15	3.56
S	0.16	1.23
T	0.18	2.76

Table 1: Moisture and aflatoxin content of sampled oils

The results for the moisture content and aflatoxin concentration is presented in table 1. The moisture content of most samples were below the NAFDAC's permissible limit of 0.29%. Only four samples (J, L, N, and P) had moisture content above this limit. In the study by Oji et al (2015), all five samples had moisture content above permissible limits. The study was done based on selected markets in Port Harcourt. These markets get their supply from the Oil Mill market. It is possible that the high moisture content recorded by Oji et al was due largely to handling after purchase from the source. The purpose of determining the moisture content was to check for a correlation between moisture content and aflatoxin concentration. Of the four samples whose moisture content were above permissible limit, only one (sample L) showed an aflatoxin concentration that was beyond NAFDAC's permissible limit of 4.0 ng/g. The two other samples (C and D) that showed aflatoxin concentration higher than the permissible limit had moisture content within permissible limit.

Based on the findings, most of the palm oil sold in Oil Mill market can be said to be largely fit for consumption (base on aflatoxin level) since the aflatoxin levels were generally within acceptable limits. The result shows no correlation between moisture content and aflatoxin content.

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