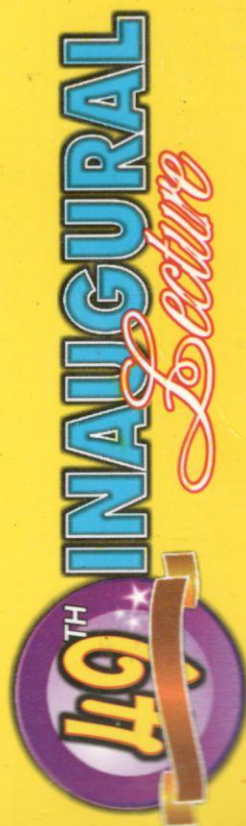


BETWEEN POISON AND PROSPERITY

(WE LE RURUN KURUN)



Delivered by

BABATUNDE MUNIR OGUNSANWO
Professor of Analytical / Environmental Chemistry

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Pursuing for Academic Excellence



Prof. Babatunde Munir Ogunsanwo
B.Sc (Hons), M.Sc. (Ibadan) Ph.D (Ibadan) FCSN, FIDPM, MAC

Between Poison and Prosperity (We le rurun kurun)

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Prof. Babatunde Munir Ogunsanwo

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**49TH INAUGURAL LECTURE
OLABISI ONABANJO UNIVERSITY
AGO-IWOYE**

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49TH INAUGURAL LECTURE iii

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Between Poison and Prosperity *(We le rurun kurun)*

INTRODUCTION:

I give God the glory for standing here today to deliver the 49th inaugural lecture in the life of our great University. It is the first from a Professor of Analytical/Environmental Chemistry and the 8th from the Faculty of Science.

We le rurun kurun is the story of a young Chemist in a dilemma- a dilemma between scientific postulations and grandmother's prediction. Please come along with me as I narrate this short story to you.

Aalo oo, in this story, there are three principal actors- A young man, a grandmother and a group of carcinogenic compounds called Aflatoxins.

1.2 The young man

The young man who is standing before you now, found himself in the area of Chemistry by miscalculation. It all started in the mid-60s when my uncle, Omoba Bayo Ogunnaike returned to Sagamu and established a thriving enterprise called *Aranse Olu* Chemist. Within few months, he demolished his mother's old house located in the heart of the town, and replaced it with the most modern structure in the town as at that time. In addition and importantly, he became the most influential person around as the elites within and around Remo were always coming to relax at *Aranse Olu* Chemist every evening.

As a young boy, my ambition was to wield such an enormous influence like my uncle in my adulthood and as such I paid special attention to Chemistry while in the Secondary School so as to become a Chemist. I kept this 'pathway to affluence and influence' secretly to myself for obvious reasons until I wrote my last paper as an undergraduate at the University of Ibadan when I proudly informed my friends that I was not going to take part in the NYSC scheme as I would not be seeking

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employment. I even requested them to visit me in Sagamu where I intended to establish a Chemist shop. One of my friends sympathized with me and educated me that only graduates of Pharmacy (a word I was hearing for the first time) are licensed to operate Chemist shops. I became miserable that day but in retrospect, I thank God for my miscalculation.

1.3 The grandmother

My grandmother, Madam Orebowale Akintola, who passed on to the great beyond about three years ago was a strict disciplinarian who in her lifetime, was always winning an argument.

As her first grandson, 'iya ologi' as she was popularly called, was very fond of me and was always indulging me in conversations which as usual were always resolved in her point of view. As a growing child one of my ambitions was to see the day I would tell *iya ologi* that she was wrong; this desire turned into an obsession each time I lost an argument to her.

My opportunity finally came during my research for a Doctorate degree at the University of Ibadan, when I was to study the Effect of Processing on the Aflatoxin contents of some Food and Food products.

1.4 Aflatoxins

Aflatoxins [1] are a group of heterocyclic, oxygen containing mycotoxins that possess the bisdifurano ring system. It is important at this stage to define mycotoxins as a group of chemically diverse secondary fungal metabolites which induce a variety of toxic responses in humans and animals when foods or feeds containing these compounds are ingested. Aflatoxins may be classified into two broad groups depending on the structure. These are the difurocumarocyclopentenone series, consisting of aflatoxins: B₁, B₂, M₁, M₂, M_{2a}, and aflatoxicol (Fig 1) and difurocumarolactones whose membership includes aflatoxins: G₁, G₂, GM₁, GM₂, GM_{2a}, and B₃ (Figs 2 & 3).

Aflatoxins are produced naturally by several species of the moulds *Aspergillus* and *Penicillium*.

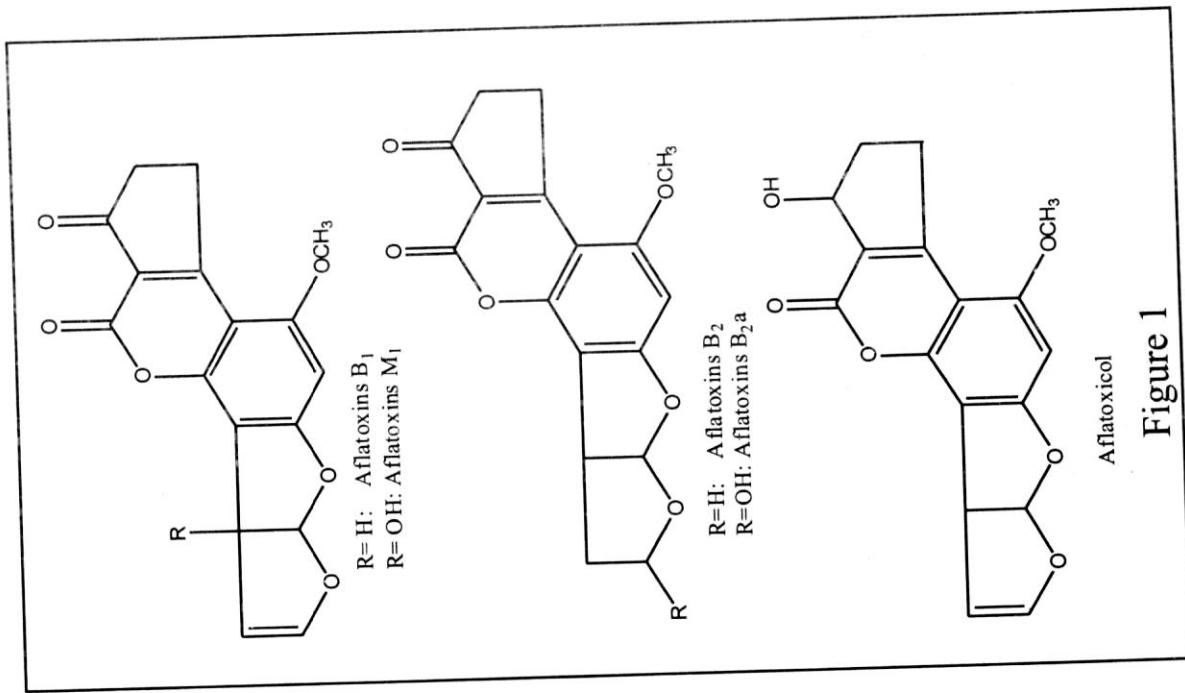


Figure 1

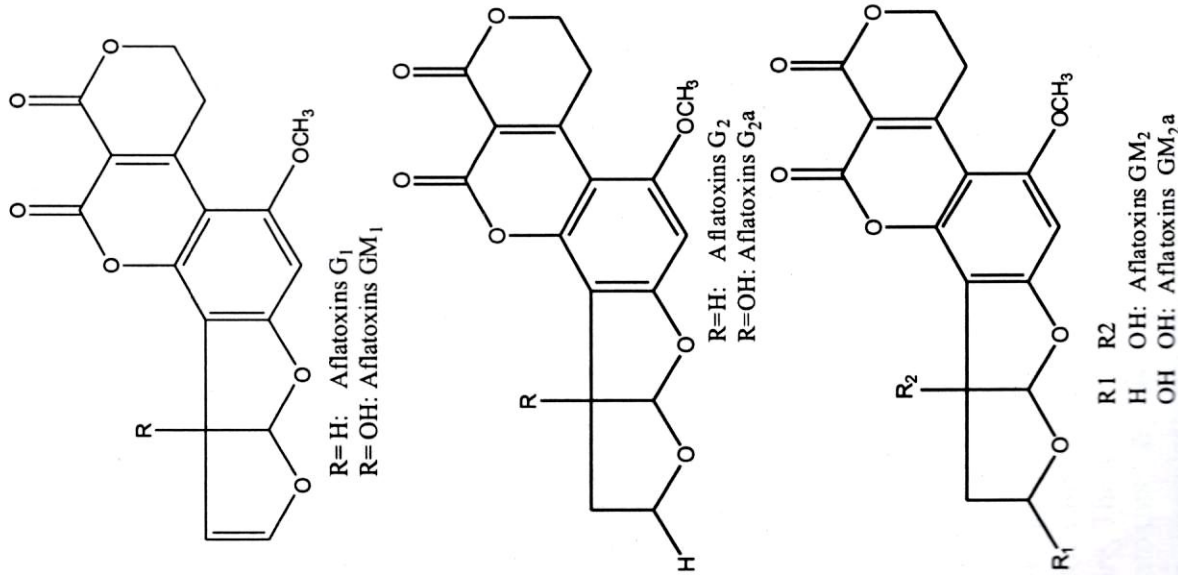


Figure 2

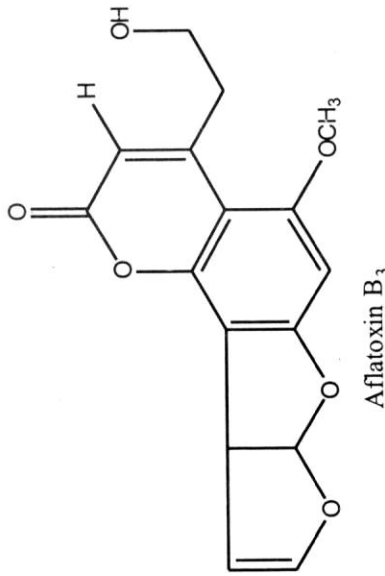


Figure 3

2. HEALTH IMPLICATIONS OF AFLATOXINS

Prior to 1960, nothing was known about aflatoxins. In that year some alarming reports came from farms in south-east of England of a mysterious condition known as Turkey X disease which resulted in the deaths of about 100,000 young turkeys and tens of thousands of ducklings and pheasants.

Deaths on such a scale, together with their serious economic implications, stimulated intensive scientific investigations in many countries. Eventually, the compounds responsible for the disease were isolated and called aflatoxins.

The disease conditions caused by the action of aflatoxins could be divided into two classes: Toxicity and Carcinogenicity

2.1 Toxicity

The toxic properties of the aflatoxins manifest in different ways according to the test system adopted, the dose given and the duration of exposure. The sensitivity of animals to aflatoxins also varies from species to species and even among individuals of the same species. Sex of the animal had also been reported to determine susceptibility to aflatoxin.

It is now well established that aflatoxins are lethal to various animals with

B₁ being the most acutely toxic of the major aflatoxins, followed by G₁, B₂ and G₂ in order of decreasing potency.

The main site of aflatoxin attack is reported to be the liver with bile duct hyperplasia being the most characteristic and easily identifiable result of aflatoxin poisoning.

In addition, Kidney tubular damage had been reported in Guinea pigs and Monkeys while aflatoxin poisoning had been cited in poor egg production and decreased egg weight in breeder hens.

There had been reports of cytotoxicity affecting calf kidney cell cultures, human embryonic lung cells, duck embryo cells, and chick embryo cells while tetragenicity had been reportedly produced in hamsters by Aflatoxin B₁ poisoning.

2.2 Toxicity to Man

Hepatitis arising from aflatoxin poisoning was first reported in a fifteen year old Ugandan who seemed on clinical examination to be in a state of heart failure. He died after a six-day history of abdominal pain and swelling. Two younger members of the family also showed similar but milder symptoms to those of the dead boy. The family diet consisted mainly of cassava found later to contain 1.7 mg/kg aflatoxins.

Aflatoxins were also implicated in an outbreak of hepatitis in India in 1974. The outbreak lasted two months and was confined to rural areas and to populations whose staple food was maize. Clinically, the disease was marked by a brief period of fever associated with vomiting and anorexia, followed by jaundice. The clinical course was variable, but 106 out of 397 patients died. Death was usually sudden and was preceded by a massive gastro-intestinal haemorrhage. Men were twice as frequently affected as women but the condition was uncommon in young children. Various cases of aflatoxin poisoning had since been reported from various countries.

2.3 Carcinogenicity

There is a growing belief that most cancers in man are induced by

chemicals and that in consequence, many tumours should be preventable if the active carcinogens can be identified, neutralized or eliminated.

Hepatocellular carcinoma had been reported in most species of animals especially in the rat where the dose required for tumour production had been found to be very small.

In addition, carcinoma of the glandular portion of the stomach, renal, adenocarcinoma and colonic carcinoma in rats had been well documented. Apart from rats, tumours had been observed in the livers of other animals such as trout, sheep, monkey as well as in man [2-5].

3. THE STORY CONTINUES

In the early morning of Monday 21st February 1983, an inferno consumed the analytical laboratory of the Department of Chemistry, University of Ibadan. In the process all the results of my PhD research under Prof Oladele Osibanjo, were destroyed. This devastating event made me to wander for about twelve months without any academic activity. In the process, I lost my job at the University and it appeared as if my world was collapsing as I practically had nothing to do each day for one year. On several occasions my father, Pa Lamidi Ogunsanwo of blessed memory had to send money to me in order to keep body and soul together.

Throughout my ordeal I never lost my focus, which was to obtain a doctorate degree at the Chemistry Department of the University of Ibadan, against every odd.

The turning point for me came in March 1984 when Prof Olu Faboya popularly referred to as bro Olu or bro O by his boys amongst whom I am number one, accepted to be my supervisor with the young energetic Dr Remi Idowu as the co-supervisor.

Our first area of research interest was on *Cannabis sativa* or 'Indian hemp', but the unavailability of the standard, tetrahydro-cannabinol made us to abandon the research after about six months of intense investigation. We were therefore forced to look into other areas of National interest.

Now, ever since the implications of aflatoxins as the aetiological agents in numerous diseases known as aflatoxicoses, many countries have routinely been monitoring the levels of these toxins in their foods, feeds and agricultural products. In Nigeria, work on aflatoxins as at that time was mainly on their production and toxicity and it is important at this stage to acknowledge the Department of Biochemistry, University of Ibadan for its pioneering work on the biochemical aspects of aflatoxins. Our team therefore decided to join the global research on the evaluation of aflatoxins in foods and food additives or condiments.

Our first object of investigation was *ogiri* a fermented melon seed condiment which is widely used by various tribes in Nigeria. Immediately after the decision to work on *ogiri*, I rushed to Sagamu, my hometown to inform my grandmother who all along had been so worried about my predicament. I was so excited about telling '*iya ologi*' about this new area of research for two reasons: in the first instance the information would put her agitated mind to rest, and secondly, the idea of working on her only stew/soup condiment to my mind would excite her greatly.

As soon as I told her my new research focus, '*iya ologi*' retorted thus: '*mi gbo! Se tori ogiri run won se ma ma pe e ni dokita? Kon de ma ma pe emi re mu dede run re wa n nogiri?* That is 'I can't hear you! Is it on *ogiri* that you will be addressed as a doctor? What then will I who knows everything about *ogiri* be called? I then took time to educate her that the result of our investigation could either increase the commercial value of *ogiri* if found to be toxin-free or otherwise reduce food poisoning.

Thereafter, she prayed that the new investigation would take me to the promised-land, but still told me "*we le rurun kurun re da nnu ogiri* that is 'you would not find anything bad in *ogiri*'. My first reaction was pure astonishment which was almost immediately replaced with an inner joy to proof once and for all that even '*iya ologi*' could be wrong knowing fully

that aflatoxins had been detected in various food products and additives in many parts of the world.

I requested to know her reason for her dismissive statement and all she told me was "go and do your work and when you have a result come back for discussion" my efforts to draw her out into a debate only made her to keep looking at the floor and knowing her very well, I knew the discussion was over and I had been dismissed.

I returned to Ibadan with a stronger determination to analyze as many *ogiri* samples as possible in order to consolidate my eventual triumph.

4. SAMPLE COLLECTION/PREPARATION/FINDINGS.

Ogiri is usually prepared from melon seeds (*Citrullus vulgaris*, Schrad) and melon being an oilseed which is reported to contain 2.5 % soluble sugar and 11% starch by weight [6], is expected to support the growth of *A. flavus* and consequently contain aflatoxins.

Market samples of *ogiri* purchased randomly several times across eight states of the Federation and laboratory samples were analyzed for aflatoxin contamination.

Aflatoxin was not detected in any of the samples. The process was repeated using *A. flavus* contaminated melon seeds and yet aflatoxin was not detected in the *ogiri*. Consequently, there was a need to find out the fate of aflatoxins during the preparation of *ogiri*.

Among the various steps involved in *ogiri* preparation, loss or degradation of aflatoxin could be expected as a result of any or all of the following:

- Boiling of wrapped melon seeds to softness,
- Fermentation of soft seeds,
- Microbial growth in fermenting *ogiri* mash, and
- Acidity of fermenting mash.

Consequently, inoculated melon seeds were used to prepare *ogiri*. Samples were analyzed after boiling to softness and also on each day of fermentation. Microbial activities of the fermenting mash were also monitored on daily basis along with the acidity of the mash. The water used for boiling the seeds was also analyzed and found in each case, to contain no aflatoxin. This therefore eliminated the possibility of leaching as being responsible for the loss of aflatoxins during the preparation of *ogiri*.

The fate of aflatoxins during the preparation of *ogiri* was studied with three different levels of contamination and from the results [7], it was established (Fig 4) that prolonged boiling of melon seeds to softness accounted for an average of about 18% reduction in B₁ contents of the seeds. Since leaching of the toxins during boiling had been eliminated, the loss of toxins during boiling of the seeds could therefore be explained either in terms of thermostability of the toxins or in terms of thermodynamically enhanced reactions between the toxins and other constituents of the seeds.

The subsequent loss of aflatoxin in the fermented *ogiri* mash must obviously be as a result of fermentation of the boiled seeds and there are two basic possible reasons for this observation namely: the acidity of the mash and the microbes present in the fermenting mash.

5. THE STORY ENDS

Mr. Vice Chancellor Sir, let me at this juncture make a public confession that I never went back to *Iya ologi* to discuss my results and each time she asked me about the progress in my research, my constant reply was 'o ku die Mama' that is the work was nearing completion.

With the completion of work on *ogiri*, my attention was focused on the fate of aflatoxins in soybeans during the preparation of soyogi. Soyogi is

the patent name given to fermented soybean flour produced by the Federal Institute for Industrial Research, Oshodi (FIIRO), Lagos. This product is usually prepared from a mixture of soybean and corn; the former being added to supplement the protein content of the latter.

Natural occurrence of aflatoxin contamination in soybeans had been reported [8-10] even though the levels were usually found to be very low, probably because of the hard texture of the seeds. In order to enhance the monitoring of aflatoxin levels in my investigation therefore, the seeds were inoculated with *A. flavus* and the contaminated seeds were processed to Soyogi. From the results [11], autoclaving the seeds at 121°C for 5 min which was expected to destroy the trypsin inhibitor, was found to be responsible for an average of 8.1% and 11.8% reductions in G₁ and B₁ respectively. Corresponding reductions of 24.3% and 26.5% were recorded in the seeds at the end of the first day of fermentation. Soyogi obtained after 3 days of fermentation lost 51.4% and 55.9% G₁ and B₁ respectively. When cultured, the fermented mill was found to contain bacteria colonies and these apart from aiding fermentation, could have been responsible for the degradation of the aflatoxins as mentioned in the case of *ogiri*.

Pap or *ogi* (of which soyogi is a member), is seldom consumed alone and as such, any investigation on soyogi would be incomplete without a complimentary work on *akara* and/or *moinmoin*. Consequently, my next line of investigation was on cowpea.

Consumption of cowpeas continues to be a major source of protein, especially in developing countries. In our country, cowpea seeds are usually consumed after boiling to softness and mixed with ingredients such as pepper, salt and palm oil to form porridge. Other processing methods involve wet milling the cowpea seeds and either steaming in tins/cups or in leaves to form *moinmoin* or frying in oil to form *akara*.

Earlier workers [9] had reported detection of aflatoxins in raw cowpea seeds. It therefore became necessary to investigate the fate of aflatoxins when raw cowpeas are processed into various products. For this purpose, two varieties of artificially contaminated cowpea seeds (Ife-brown and Ife-white) were used.

The first striking observation [12] was the fact that the Ife-brown variety tends to support higher growth of *A. flavus* than the white variety. Furthermore, removal of testas after soaking the seeds was responsible for about 9.1% and 10.2% respectively in B₁ and G₁ in the Ife-brown seeds while 13% reduction was recorded for each toxin in the white variety.

In the Ife-brown seeds, cooking at 100°C for about 2hrs resulted in average reductions of 27.3% and 30.6% respectively for B₁ and G₁ while corresponding reductions of 30.4% and 34.8% were recorded in white seeds cooked for the same period. These reductions could be as a result of the reasons advanced earlier. It is also possible that hydrolysis of these compounds occurred during cooking.

In addition, the hot water could have leached the toxins from the seeds during cooking while the leached compounds got degraded in the hot medium. Such degradation might be responsible for the non-detection of aflatoxins in the water used for boiling melon seeds in the preparation of *ogiri* as reported earlier.

Frying the milled seeds in oil during *akara* preparation resulted in an average of 21% reduction for each toxin in the Ife-brown variety while about 26.1% and 32.6% reductions for B₁ and G₁ respectively were obtained in the white variety. Steaming of wrapped milled seeds for about 2.5min during the preparation of *moinmoin* resulted in 20% and 18.4% reductions in B₁ and G₁ respectively in the Ife-brown variety. In the white variety, 24% reductions of each toxin were obtained. The fact that these values were higher than those obtained for boiled cowpea seeds might be

due to the milling of the seeds which naturally must have resulted in higher heat penetration and subsequent higher level of detoxification of the samples.

Frying in oil accounted for higher loss of the aflatoxins than steaming of the milled seeds and this was most likely due to the difference in the intensity of the heat used in both cases, the heat of frying in oil being higher than that of steaming.

Mr. Vice Chancellor Sir, it is important at this juncture for us to take cognizance of an emerging trend in the level of aflatoxins in the agricultural materials reported so far and that is the fact that no matter the levels of aflatoxins in these materials, significant reductions in toxin levels usually occur during processing.

With the establishment of this trend it became necessary to see if it could be applied to a popularly consumed product or group of products. The lot therefore fell on Peanut and Peanut products for the following reasons:

(i) Prior to the advent of 'oil boom' era in Nigeria, a substantial part of the foreign earnings of our country accrued from peanuts. This formed the basis of the famous groundnut pyramids in the Northern part of the country at that time.

(ii) Consumption of peanut is very popular among the entire populace throughout this country and many parts of the world.

(iii) Peanut is one cheap source of protein, fat, minerals and vitamins and is therefore a common denominator between the rich and the poor; the employed and unemployed as encapsulated by the music legend Tunji Oyelana in his famous album rendered thus:

'*balakowe ba gbowo osu tan, a si ma yan kondu kiri; "e ba mi mu beer, enh!, e ba mi mu staotu, enh!, e ba mi mu chicken, enh!, e ba mi mu snail,*

enh!" amosa, to'su ba wa di on the gberefu, a raniti omo oni guguru, guguru perere epa perere, guguru perere epa perere, guguru perere, epa perere, guguru perere epa perere.' This could be translated as follows: 'as soon as a civil servant collects his monthly salary, he becomes arrogant (and says) "give me beer, eh!, give me stout, eh!, give me chicken, eh!, give me snail, eh!" but at the dry period (middle of the following month) he will remember the popcorn seller, plenty of popcorn, plenty of peanut 4x.'

The first step was to screen commercially available peanuts and peanut products (namely: peanuts, the cake or 'kwulinkwuli', peanut butter and 'donkwa') in the country because Idile and co-workers [13] had reported that Nigerians have important host factors which could pre-dispose them to the tumorigenic action of food contaminants in the environment. Consequently, peanut and peanut products were purchased from street hawkers, markets and retail shops at different locations throughout the country. Representative results [14] from each region of the country are shown in fig 4. A similar trend was obtained in our recent survey [15].

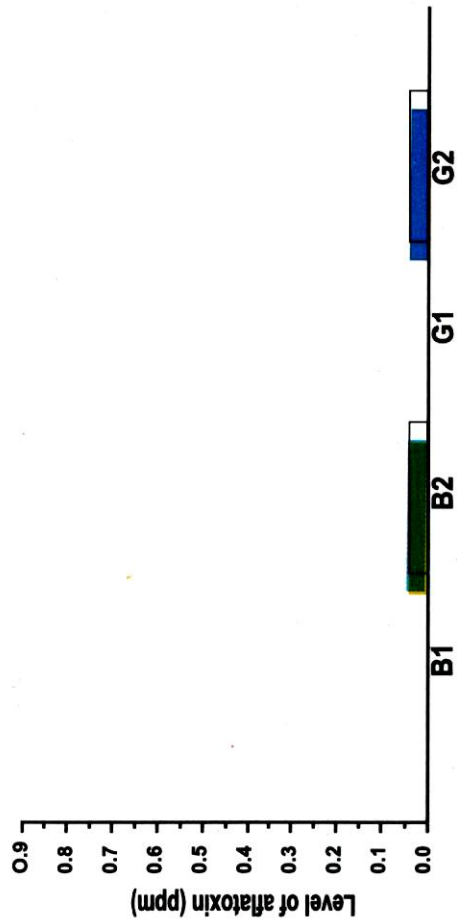


Figure 4a, Level of aflatoxin in South East Nigeria
Sample: Boiled Peanut Seeds

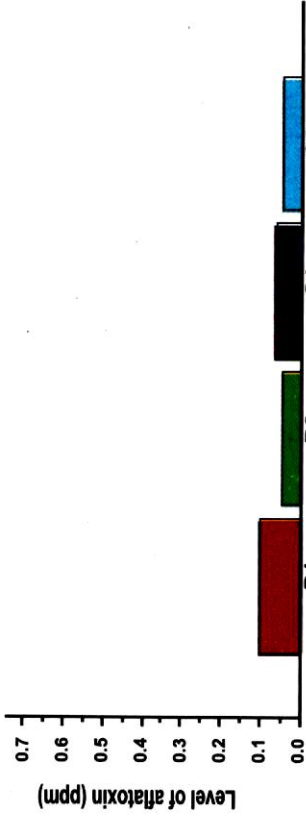


Figure 4b: Level of aflatoxin in South - South Nigeria
Sample: Locally roasted Peanut Seeds

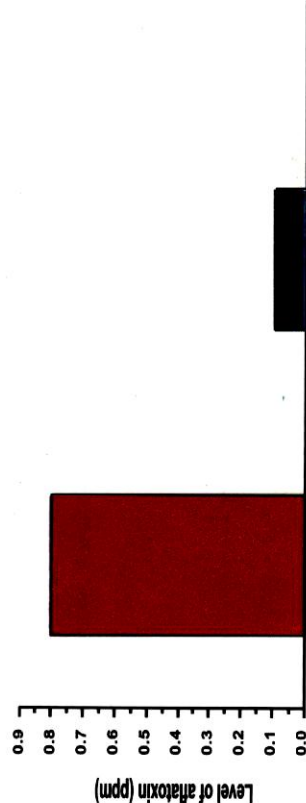


Figure 4c: Level of aflatoxin in North - Central Nigeria
Sample: Kwulinkwuli Samples

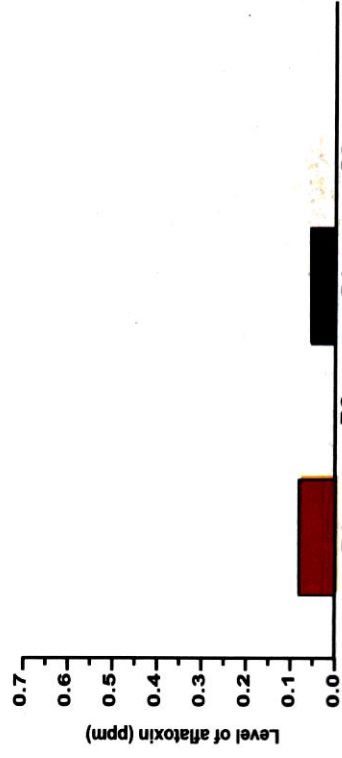


Figure 4d: Level of aflatoxin in North - Central Nigeria
Sample: Locally roasted Peanut Seeds

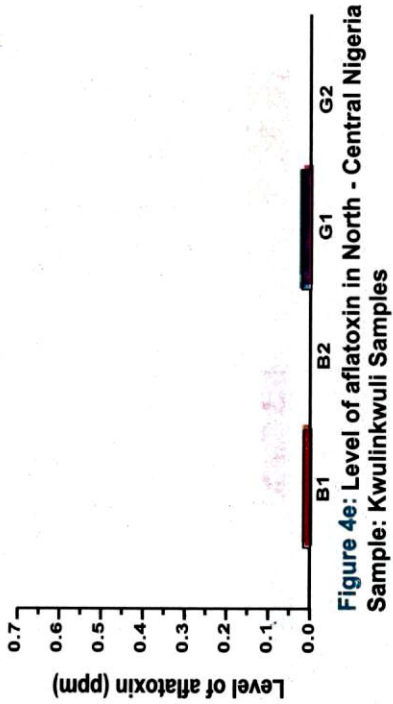


Figure 4e: Level of aflatoxin in North - Central Nigeria
Sample: Kwulinkwuili Samples

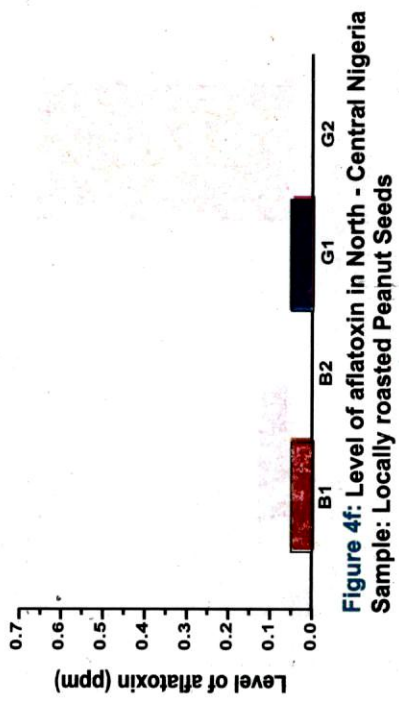


Figure 4f: Level of aflatoxin in North - Central Nigeria
Sample: Locally roasted Peanut Seeds

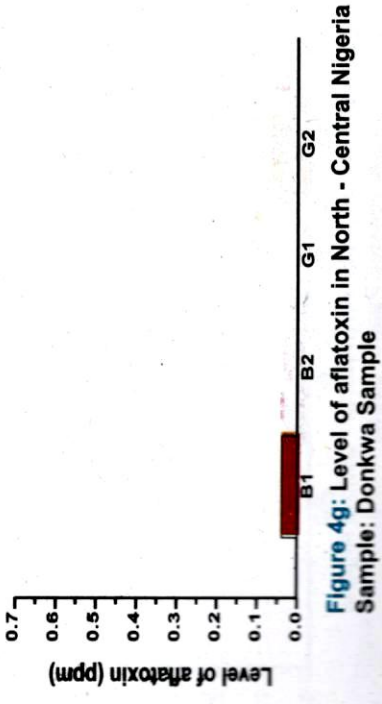


Figure 4g: Level of aflatoxin in North - Central Nigeria
Sample: Donkwa Sample

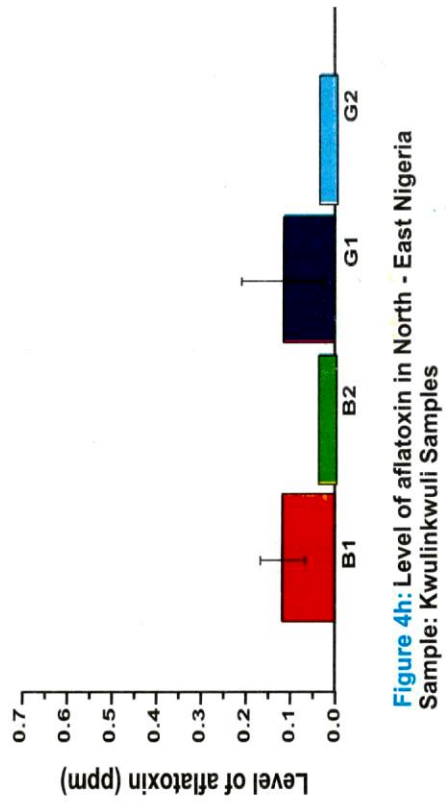


Figure 4h: Level of aflatoxin in North - East Nigeria
Sample: Kwulinkwuili Samples

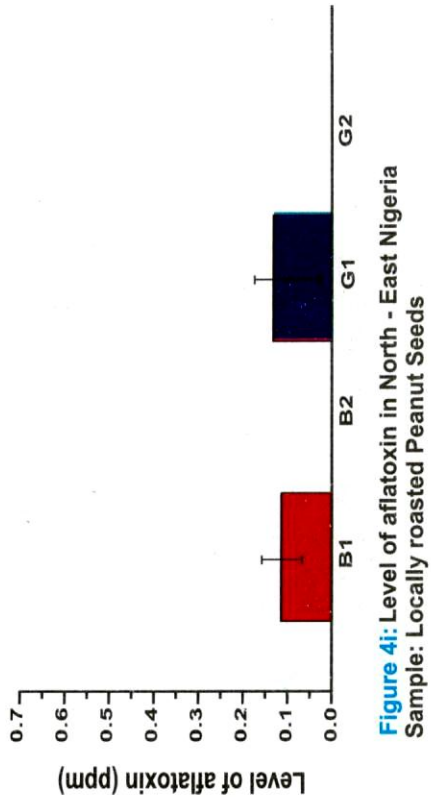


Figure 4i: Level of aflatoxin in North - East Nigeria
Sample: Locally roasted Peanut Seeds

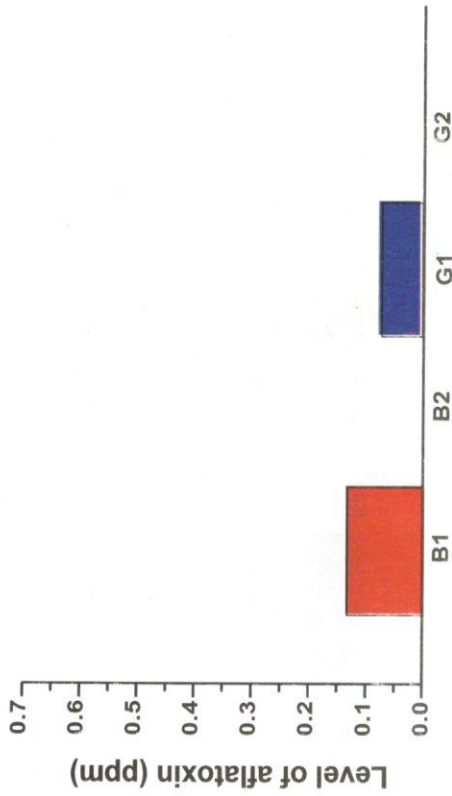


Figure 4j: Level of aflatoxin in South West Nigeria
Sample: Boiled Peanut Seeds

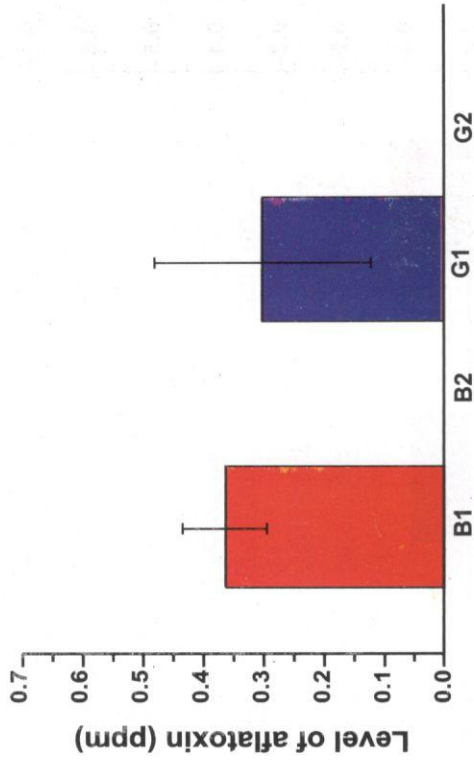


Figure 4l: Level of aflatoxin in South West Nigeria
Sample: Donkwa Sample

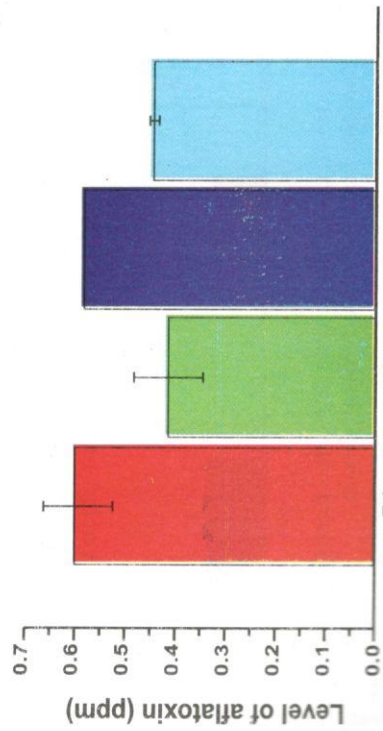


Figure 4k: Level of aflatoxin in South West Nigeria
Sample: Butter Sample

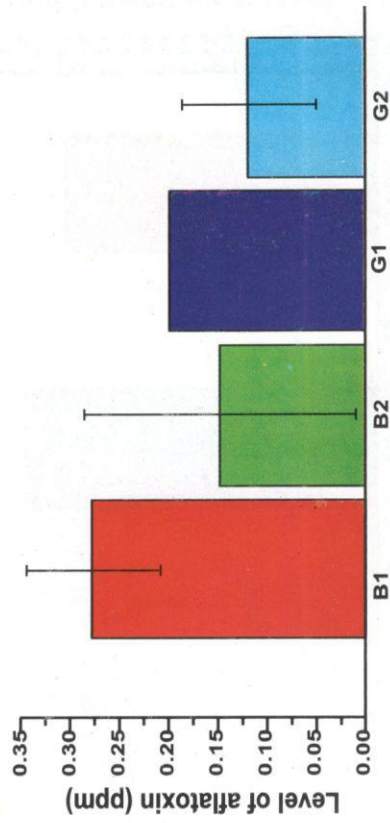


Figure 4m: Level of aflatoxin in South West Nigeria
Sample: Kwulinkwuli Sample

It is important to bring out the following highlights:

- (i) More than 50% of the samples were aflatoxin-free.
- (ii) The highest level of B₁ and G₁ were found among the Oyo state samples of *kwulinkwuli*.
- (iii) Aflatoxins were not detected in most of the *donkwa* samples and even where detected, the levels were very low. The low levels of toxins in this product and possibly the non-detection in most of the samples could probably be due to the dilution effect of the corn in the product.
- (iv) Factory roasted seeds contained far higher levels of B₁ and G₁ than the locally roasted seeds. Reasons for this pattern could not be far-fetched; in the first instance, large consignments of the seeds are usually purchased in the factory and stored in silos. This practice encourages growth of mould and subsequent rapid attack of *A. flavus* on the seeds. Secondly, the factory samples are usually light yellow and this implies a mild roasting condition. Such roasting conditions might not necessarily reduce the levels of the toxins appreciably. Lastly, the factory samples are usually packed in polythene materials and this practice will also promote rapid re-infestation of the processed seeds as a result of the warm environment provided by the enclosure particularly where efficient refrigeration is not obtainable.

(v) Aflatoxins B₂ and G₂ were present only in less than 5% of the samples.

(vi) All the commodities except the factory roasted peanut seeds contained the toxins at levels very much below the safety level. One may therefore be tempted to conclude that the levels of the different toxins in peanut products in the country, are rather too low to be of any concern with respect to, at least, acute toxicity. However, it is important to recall that these compounds are not metabolized into non-toxic compounds in the body, but rather converted from one form to another. Thus they could

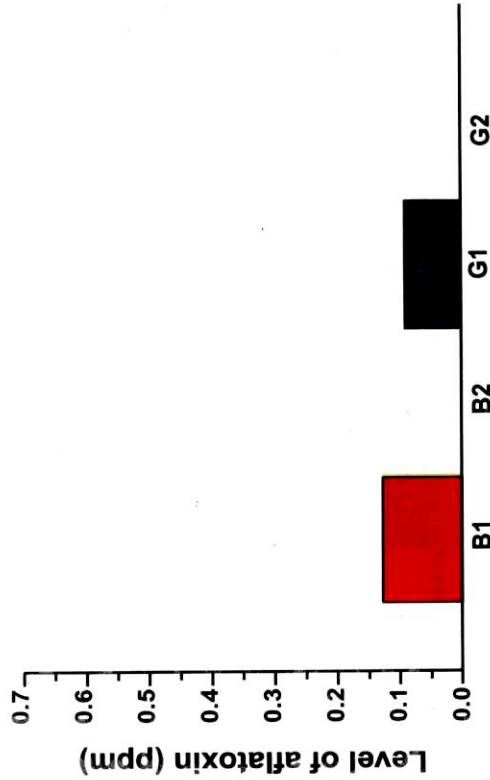


Figure 4i: Level of aflatoxin in South West Nigeria
Sample: Locally Roasted Peanut Seeds

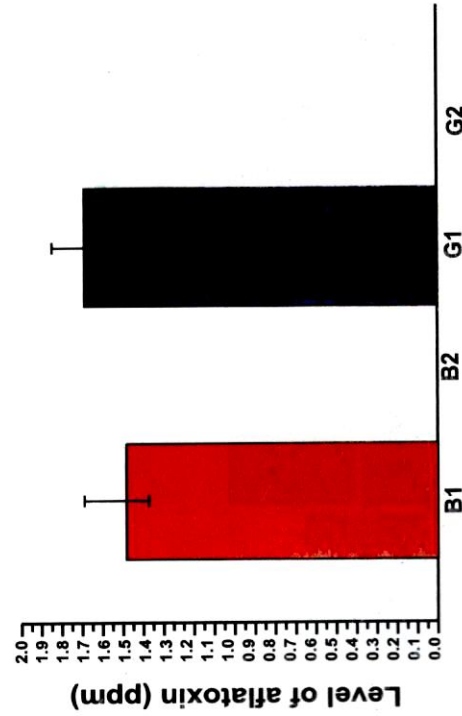


Figure 4o: Level of aflatoxin in South West Nigeria
Sample: Factory Prepared Roasted Peanut Seeds

accumulate in one form or the other in the body to a dangerous level.

Detection of the toxins in peanut products coupled with their bio-accumulative property made it mandatory to investigate the effect of processing on the aflatoxin contents of Nigerian peanut and peanut products as well as finding processing conditions that would give minimal or no-aflatoxin in the products.

The first of such an investigation was carried out on the seeds. Roasted peanut seeds were prepared with variations in roasting conditions [16] and from the results (Fig5a-e), it was obvious that roasting causes reduction in the levels of aflatoxins in peanuts. This observation was in agreement with other reports [17-21].

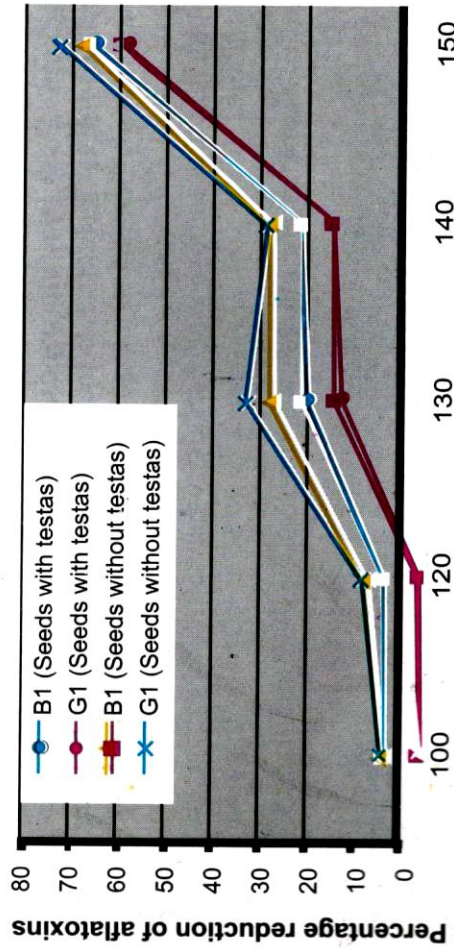


Figure 5a: Percentage reduction of aflatoxins in peanuts seed roasted for 20 minutes

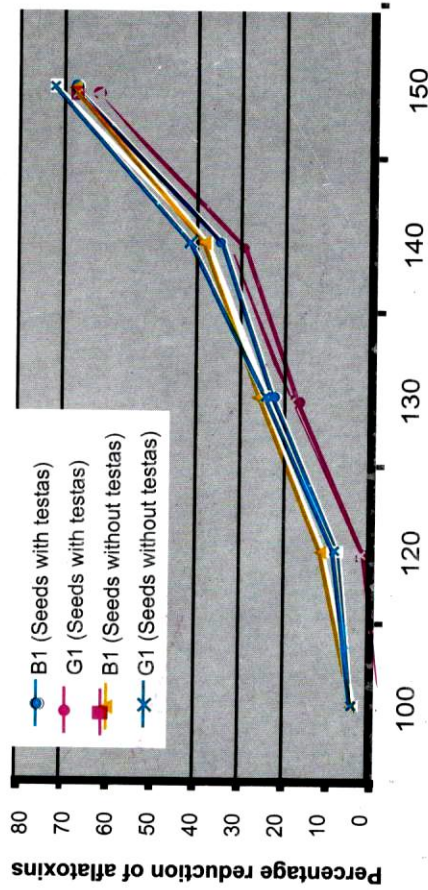


Figure 5b: Percentage reduction of aflatoxins in peanuts seed roasted for 25 minutes

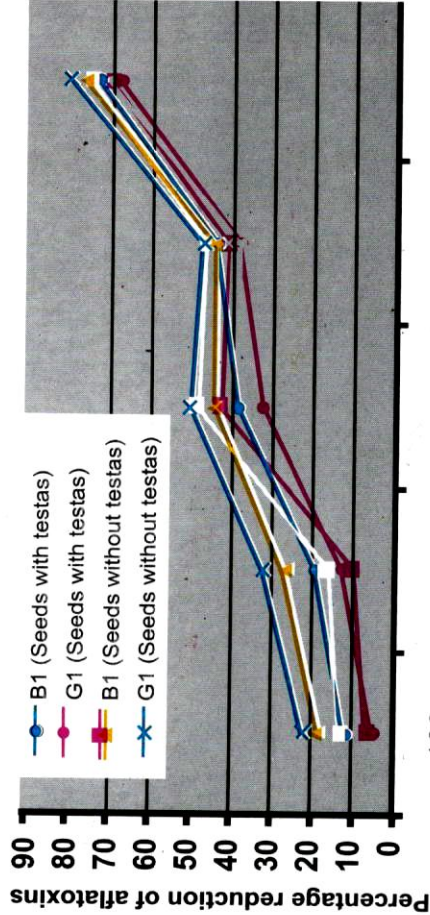


Figure 5c: Percentage reduction of aflatoxins in peanuts seed roasted for 30 minutes

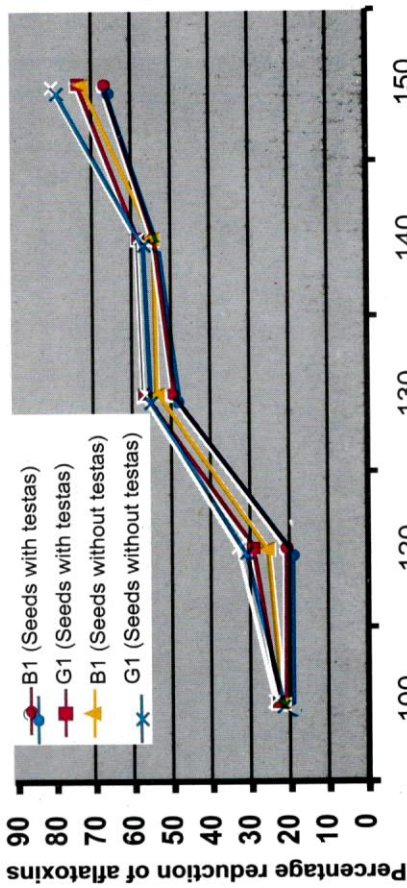


Figure 5d: Percentage reduction of aflatoxins in peanuts seed roasted for 35 minutes

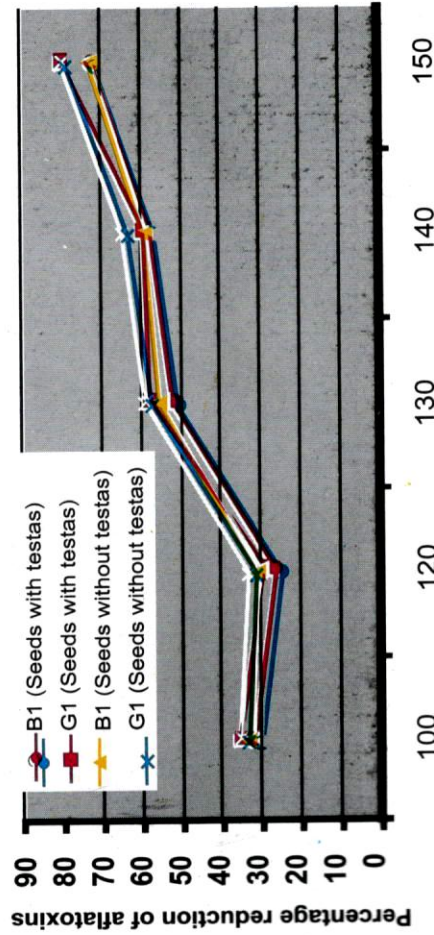


Figure 5e: Percentage reduction of aflatoxins in peanuts seed roasted for 40 minutes

The investigation was thereafter extended to peanut products [22], and from the results obtained, (Samples of which are displayed in Tables 1 and 2 as well as Fig 6), the following deductions could be made:

Table 1: Effect of roasting temperature and time on the levels of aflatoxins B₁ and G₁ in peanut butter

Roasting Time	Amount of toxin in raw seeds		Average amount of toxin in butter		Loss of toxin (ppm)		Percentage reduction	
	B ₁	G ₁	B ₁	G ₁	B ₁	G ₁	B ₁	G ₁
60.0	1.60	1.32	0.64	0.79	0.96	0.53	60.0	40.2
75.0	1.60	1.32	0.64	0.79	0.96	0.53	60.0	40.2
30.0	4.77	4.96	1.27	2.12	3.50	2.84	73.4	57.3
45.0	4.77	4.96	1.00	1.72	3.77	3.24	79.0	65.3
30.0	3.00	0.74	0.86	0.26	2.14	0.48	71.3	64.9
45.0	3.00	0.74	0.62	0.21	2.38	0.53	79.3	71.6
30.0	3.00	4.96	0.80	2.98	2.20	2.98	73.3	60.1
45.0	3.00	4.96	0.51	0.91	2.49	4.05	83.0	81.7
30.0	4.81	3.96	1.05	0.86	3.76	3.10	78.2	78.3
45.0	4.81	3.96	0.73	0.90	4.08	3.06	84.8	77.3

Table 1: Effect of roasting temperature on the levels of aflatoxins B₁ and G₁ in Donkwa prepared from peanuts seeds roasted for 45 to 60 minutes

Roasting conditions	Average level of toxins (ppm) without testas		Seed		Percentage reduction without testas		Seeds	
	B ₁	G ₁	B ₁	G ₁	B ₁	G ₁	B ₁	G ₁
Temp	B ₁	G ₁	B ₁	G ₁	B ₁	G ₁	B ₁	G ₁
130	45.0	0.80	0.79	0.40	44.4	50.0	72.2	81.0
120	50.0	0.96	0.99	0.48	33.3	37.3	66.7	68.4
130	50.0	0.80	0.59	0.40	44.4	62.6	72.2	81.0
120	55.0	0.96	0.99	0.48	33.3	37.3	66.7	68.4
130	55.0	0.64	0.59	0.32	55.6	62.6	77.8	81.0
120	60.0	0.96	0.99	0.48	33.3	37.3	66.7	68.4
130	60.0	0.64	0.59	0.32	55.6	62.6	77.8	81.0

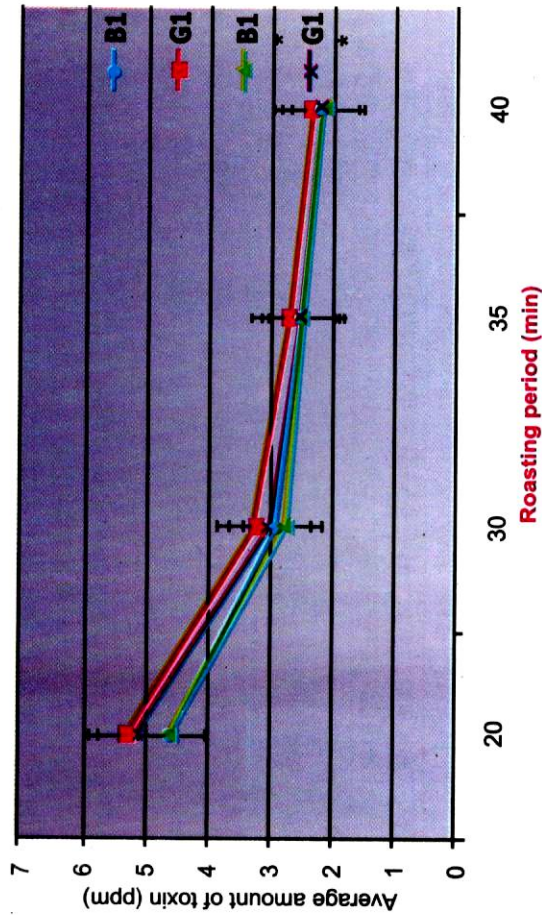


Figure G: Effect of mashing on levels of aflatoxins B₁ and G₁ peanut seeds roasted in oven at 140°C

- (i) Significant reductions in aflatoxin contents were obtained in peanut butter, *kwulinkwuli* and *donkwa* prepared from contaminated seeds exposed to different processing methods.
- (ii) Appreciable reductions in B₁ and G₁ occurred during the dry-roasting, mashing and oil roasting steps in *kwulinkwuli* preparation. No significant reduction of the toxin occurred as a result of grinding of the seeds.
- (iii) Appreciable further reduction of the toxins occurred during mashing process which suggested slight solubility of the toxins in the oozing oil.
- (iv) The higher the oil temperature the higher the reduction in the level of the toxin.

- (v) The dilution effect of roasted corn on the aflatoxin contents of *donkwa* makes it the safest among the peanut products.

At the end of the investigations, some products were found with minimal levels of aflatoxins. It was necessary therefore to determine the acceptability of these products to consumers. The products were thus subjected to a Taste Panel Evaluation of 'crunchiness', 'colour', 'flavour' and 'overall'[23].

From the results (Fig 7) seeds roasted at 140°C for 40min or those roasted at 150°C for 25 or 30min, peanut butter prepared from seeds roasted at 160°C for 30min and *kwulinkwuli* prepared from seeds dry roasted at 150°C for 25 or 30min prior to oil roasting of mashed seeds at 170°C for 2min could be recommended for consumption because they look similar to the commercial samples and their mode of preparations will always lead to drastic reductions in the levels of aflatoxins if present in the raw seeds.

6. APPLIED RESEARCH

With the successful completion of investigation on levels and fate of aflatoxins during processing of popular agricultural products, I shifted my focus to materials of industrial application. The first of such investigation was on the isolation and analysis of Wash-Active-Substance (WAS) from the black soap [24]. The black soap is well known by various names in many parts of this country and possibly beyond (Yoruba-*ose dudu*; Igbo-*Ncha nkota*; Hausa-*Saburu soro*). It's usage includes washing of hair and body, serving as a medium for various drugs employed in the treatment of skin diseases, pimples, rashes, measles etc as well as general washing of clothes and utensils.

The wash-active-substance (WAS) which is the portion of the soap that does the real washing was isolated from the black soap and found to

At the risk of immodesty, I am proud to state that I have since then contributed and continue to contribute my quota to the physical development of our great University by facilitating the following:

- (i) Donation of Rasheed Raji Building on the Main Campus, to the University by His Excellency, Navy Captain Rasheed Adisa Raji, the former Military Governor of Bauchi and Sokoto States.
- (ii) Donation of Oba Adeniyi Sonariwo Pharmacy Complex in Sagamu by the Sagamu people.
- (iii) The construction of WAPCCO Instrumentation Centre and the understanding of WAPCCO to equip the centre.
- (iv) An on-going construction of a N200 million Faculty of Science Central Research Laboratory by the Faculty Advisory Council under the leadership of *Otunba* S.K. Onafowokan, the *Asiwaju* of Remo. The first phase of this project which commenced earlier in the month and is estimated to cost about N60million is being sponsored by Dr. Akin Ogunlewe, Chairman Lamont Oil & Chemical Ltd.

Perhaps I should mention that I once received the University's commendation on fund raising activities.

7.2 Administrative Responsibilities

In 1995, I was appointed the coordinator of the Pre-degree Science programme by the then Vice-Chancellor, the pace setter Vice-Chancellor, Professor Olatunji Yinusa Oyeneye and that marked the beginning of my administrative contributions to the University. To the glory of God, during my tenure as the coordinator, I introduced the under listed:

- i. Acceptance of best ten PDS products into Medicine and Pharmacy.

- ii. Opportunity for the next best twenty five students to pick any course of study in the University.
- iii. Scholarship award for the best ten students throughout their undergraduate programmes.
- iv. Computerization of PDS records
- v. Payment of remuneration to staff involved in the teaching of the programme and consequently, insulation of the programme from staff industrial actions.

As a matter of fact, the programme was elevated to such an enviable standard that made some other Universities come to under study us.

I assumed the leadership position of my Faculty, the best, the largest and the most sophisticated Faculty in OOU, on Monday, the 5th day of September 2005 and within the last four years in office, I have been able to achieve a complete turn-around in the dwindling fortunes of the Faculty. With enhanced motivation of staff, prudent management of meager resources and pro-active leadership, my Faculty is now second to none in this University. This was made manifest by the recent National Universities Commission (NUC) accreditation exercise during which my Faculty had all its twelve programmes awarded FULL Accreditation status.

If I am to enumerate my contributions at the various committees of the University we definitely shall be here for the next two hours. Suffice it to say that I have served effectively in more than forty committees within the University as exemplified by my activities as the Chairman of the Business Committee of Senate. When appointed as the chairman of the committee two years ago my vision which was largely shared by members of the committee, was to go beyond routine arrangement of senate papers to addressing an embarrassing issue in the University- issue of outstanding results. We therefore started considering outstanding results across the

University from 1999. It is on record that the committee was able to clear all outstanding results from 1999/2000 to 2006/2007 session.

7.3 Consultancy

Mr. Vice-Chancellor Sir, I established and registered a consultancy outfit on resumption of duty and the outfit continues to be beneficial to the members, the University and the larger society. A good example of our contribution to the society is the consultancy on 'The Mineral Exploration of Sokoto State' [41] where we found very large deposits of Iron ore, Kaolin, Quartz sand, Limestone, Phosphate and Gypsum.

As mentioned by the chairman of this ceremony, I have served the society at large in various capacities such as being: a director of Odua Textile Mills, Ado-Ekiti, a Council member of the Chemical Society of Nigeria- the society of President Umaru Musa-YarAdua, a member of the National Executive Committee of the Ansar-Ud-deen Society of Nigeria etc. I have also assisted in the establishment of five Private Universities in Nigeria and currently, I am serving as the chairman of the Project Implementation Committee of the Summit University, Offa, Kwara State.

8 HANDICAPS

Mr. Vice-Chancellor Sir, research, to my mind, is the most interesting occupation in the world. Apart from contributions to the development of the society, a researcher is always in a state of mental satisfaction to the extent that acquisition of material wealth becomes immaterial to him. Whatever takes him out of this state of mind would make him frustrated. I must confess that in the last few years, I have joined the group of 'frustrated' researchers by the individual and collective actions of the under mentioned.

1. 8.1 Funding

According to UNESCO, governments should invest at least 6% of gross

national product (GNP) in education

[42]. Any sincere Nigerian would agree with me that we are very far from this target in this country and this perhaps explains the gross under-funding of University education in general and research in particular. I therefore associate with the call on the Federal government to fund our universities adequately. The Private sector should also complement the efforts of government in this respect.

For the avoidance of doubt, let me state categorically that my call on government to fund universities adequately should not be confused with the call of the Academic Staff Union of Universities (ASUU) for an upward review of salaries of its members. I strongly dissociate from this position for the following reasons:

- i. Government has no business in negotiating salary for University staff because the latter are not employees of government. The responsibility to fix the salary of any University staff should be left strictly to the Governing Council of that University if we are sincere about our demand for University autonomy and academic freedom.
- ii. The concept of unified salary structure for members of the academic staff is not only retrogressive but archaic and encourages indolence. Under this system a hardworking, industrious and innovative academic staff would have to seek motivation elsewhere as there is no difference in his 'take-home' pay and that of a lazy colleague who will not accept any administrative responsibility but rather indulges in attending to his lectures a week or two before the commencement of an examination.

In addition, this practice discourages intellectual focus on areas of National priorities such as energy and security. For example, I do not see any reason for earning the same amount with a Professor of Nuclear Chemistry just as

I do not believe that some colleagues should earn as much as I do. Employment and remuneration of academic staff should be based strictly on qualification, ability of the applicant to add value to the system beyond ordinary teaching, and ability to address areas of societal needs or priorities.

8.2 Incessant Industrial Actions.

Incessant strikes by ASUU continue to paralyze academic activities, prolong duration of courses and consequently disorientate our students. However, these strikes which are usually directed at government actions or inactions, do not always have any impact on government activities. ASUU enjoys the monopoly of being the only trade/professional body whose membership cuts across all academic and professional disciplines. Regrettably, ASUU strikes remind one of the industrial actions of the colonial era by the Nigerian Union of Railway men under the leadership of the immutable Pa Michael Imodu of blessed memory. The series of strikes were over the Cost of Labour Allowance (COLA). Their *modus operandi* even though conservative, was in tune with that era.

With the advent of technology in this modern age, it is regrettable that ASUU has not been able to formulate an enduring alternative to strike as a weapon for industrial disputes. The union cannot claim the dearth of expertise in industrial psychology, sociology, law or crisis management, who should be able to synthesize an efficient alternative to strike actions which have done more damage to the public image of ASUU, as a union of academics who are never contended but rather are ready to sacrifice the future of their students for the improvement of their personal emoluments.

I sincerely hope that the union would put a stop to this line of action which has always succeeded in inflicting unwarranted pains on parents and students otherwise Mr. Vice-Chancellor Sir, just like Dr. Martin Luther King jnr., I also have a dream that one day the University teachers shall

step out as usual on a strike and the fee paying students, who are the major stakeholders in the system, shall ask them never to return.

Furthermore, the local chapter of the union should as a matter of urgency begin a process of self sanitization. A union which claims to be at the vanguard of demand for qualitative University education cannot continue to shield academic 'dead-woods' who remain in the system for decades without self-improvement.

8.3 Others

Others such as insecurity of lives and properties, epileptic power supply, bad road network coupled with nuisance of truck drivers on the road, etc, are subjects of daily discussions by our vibrant communication media and I have nothing more to add to the constant call on the different tiers of government to be alive to their responsibilities.

ACKNOWLEDGEMENTS

Mr. Vice-Chancellor Sir, the Almighty God has been very kind to me. I was born by good parents from respected families, attended good schools, met, interacted and continue to associate with good people. The individual and collective actions of these people made today a reality. I would therefore like to pattern my appreciation in chronological sequence. First and foremost, I give adoration to the Almighty God for His divine kindness to me and for making today a reality.

My parents, both of blessed memory cared so much for me; they sent me to the best schools and provided all my needs to the extent that while I was at the University of Ibadan, even though many of my friends were children of very rich parents, I still managed to own a car before most of them. I beseech the Almighty God to grant them a comfortable part of paradise.

I say a big thank you to members of my ancestral families for their love and great support for me at all times. Please permit me to appreciate some of them: *Olotu* Lanre Akintola (the Olori-Ebi general), Chief Olu Oredipe, Omoba Bayo Ogunnaike, Alhaja Shodeinde, Engr. Bode Tobun, Alhaja Yetunde Tobun (my sweet sister of blessed memory), Alhaji Basheer Sonubi, Iya eleelo, Mrs. Sotonwa (Iya Ijebu), Messrs Wole Akintola, Wale Akintola, Isa Akintola, Kunle Akintola, Prof Olumide Sosanwo, Alhaja Adedolapo Dele, Mrs. O. Fafunso, Mrs E. Oresanya, Sheikh Shanzal Shuaib, Messrs Rasheed Ogunsanwo, Basheer Ogunsanwo, Razaq Ogunsanwo (who came from Kaduna with his friends), Bola Ogunsanwo, Biodun Ogunsanwo, Olusola Ogunsanwo, Dupe (Mama Lamide), Mrs Bukky Oyebanjo, Mrs Kemi Osho, Alhaja Sola Akorede, Mrs Bolanle S. Olubanjo, Toyin Lambo, Ade Lambo and my ever supportive, ever caring elder sister who is known by all and sundry as *Iyan kus me*.

I also wish to appreciate all my teachers from St Paul's school Ijoku Sagamu, through Remo Secondary school Sagamu and Federal

Government College Odogbolu to the great University of Ibadan. In particular, I wish to acknowledge the following: Papa Osidiye (of blessed memory), Pa Onaeko (the *Baale* of RSS who is also of blessed memory), Messrs Nwosu and Bobaniyi, Profs Gabriel Babatunde Ogunmola, Sunday Ajayi, Idowu Iweibo, Segun Ekundayo (Bros Sege), C. O. A. Sowunmi (of blessed memory) (Mrs.) Sowunmi, Obafemi Kujore, E. K. Adesogan and Dr. Remi Olaofe (of blessed memory).

Professor K. S. Patel taught me the rudiments of literature review, while Prof Dele Osibanjo introduced me into advance research and also gave me the first opportunity to partake in a UNDP project. I thank you sirs for the training.

By any standard the greatest of my teachers is the man who rescued me from academic annihilation. He was a God-sent at the most critical period of my academic life. He treated me not just as a student but also as a human being and a brother. I became a member of his family and it was very difficult for many people to believe that I was his student. Today this distinguished role model is not just the Professor of this Professor, but indeed a Professor of Professors. May I therefore respectfully request Prof Olu Faboya who is here with his gorgeous wife- aunty Tinu, to please rise for recognition. Sir, between 1984 and 1988 you taught me all the techniques needed to carry out meaningful research and therefore gave me a good pedestal to launch myself into academic prominence. Today I praise God for your mentoring.

I equally appreciate the support of my co-supervisor, my friend and brother, Dr Remi Idowu who is currently in the United States. I have always been blessed by good and supportive friends some of whom are here today. Please permit me to mention few of these bosom friends and brothers. They include: His Excellency Alhaji Rasheed Raji (Aresa), Alhaji Sheu Giwa (Lord Mato), Prince Yanju Lipede (Adeyanji),

Professors Lawon Odusoga (One Minute), Jimi Faturoti (Bonstik), Soji Adejumo (Plum plum), Tunde Ikotun (High C), Mbang Femi-Oyewo, Bamidele Durojaiye (of blessed memory), Leke Adeniyi (Tkt), Kayode Oyesiku (Super Kay) the Vice-Chancellor Tai Sholarin University of Education, Joe Nwabueze (Smokey), the immediate past acting Vice-Chancellor of University of Abuja, Femi Peters (the Deputy Vice-Chancellor, National Open University of Nigeria), Wale Olaitan the youngest Deputy Vice-Chancellor in OOU, Dolapo Alabi, the Baba Ogo Weere of OOU, Femi Adelowo, Yomi Ogun, Ayo Fadahunsi, Drs. Tunde Ladele, Dayo Gbadebo, T. A. Fakoya (Sympathetic), Gbade Adeife, Kolawole Olayinka (K eff), Segun Oyekoya Chief Dayo Ogunge, Alhajis Segun Odumesi (Obalola), Kunle Owonifari (Kunlele), Ibraheem Jimoh (Muqadam), Funmbi Dawodu (Grandmaster), Messrs Abdul Abayomi (Awabat), Biodun Ogunkoya, Wole Ogunyinka, Bashy Elegbeji, Mr. Tola Oresanya (Elegbogi), Mrs Shade Adeyanju, and Col. (rtd.) Duro Oyebanjo who along with his wife, are the parents of the most celebrated Nigerian pop star, De Banj who is also here with us today.

I belong to the Ansar-Ud deen United Family and leading the delegation of that foremost religious organization to this lecture is the National President, Alhaji Bisiriyu Olatunji Onisarotu. Other members include: the Deputy President, Alhaji Tiamiyu Olatinwo, the National Missioner, Sheikh Abdul Rahman Olanrewaju Ahmad, Vice Presidents: Aare Ade Sanni, Alhaji Munir Akanbi, and Alhaji Adeniran, National Secretary, Alhaji Abdul Rafu Adejare; Alhajas S. A. Daodu, the Chairperson National Women Advisory Council (NWAC), R. O. Oke, the National treasurer NWAC, S. A. Animashaun, F. A. Atobatele, M. Thompson; representatives of the National Executive Committee- Alhajis Lamidi Bakare, A. Adebanjo, Yiga Benson, Rasheed Adenusi, Laguda and a host of others.

To the President and members of my great Club, The Sagamites club under the able leadership of the Asiwaju of Remo, *Otunba* S. K. Onafowokan, I say this is your celebration. This is your moment *Otunba* Julius Adedoyin, Alhajis Dauda Awoyemi, G. K. Oladipo, Afolabi Awosanya, Y. P. O. Sholarin, S. A. Rabi, I. K. Dawodu, and the Sagamites ladies present here today.

My desire to become a Professor would have remained an illusion if not for the support and dedication of colleagues such as Professors O. A. Sosanwo, R. S. A. Adewusi, S. A. Bankole, K. O. Adebowale, A. J. Ogunleye (of blessed memory), M. O. Fagbule, O. O. Fafioye, Drs G. O. Adewuyi, O. S. Lawal, Messrs O. A. Oyewole and O. O. Mabekoje with whom I collaborated.

The success of any lecture is determined to a large extent by the presence and participation of the audience. I therefore sincerely appreciate the distinguished and dignifying presence of our Royalty here today. Your Royal Majesty, Oba (Dr.) Michael Adeniyi Sonariwo, (CON), FCA, ErinjugboII, Akarigbo of Remo kingdom, I know that today is your birthday this lecture is therefore a special birthday gift from a son to his father. Baba, you will celebrate many more decades on the throne; *ade a pe lori, bata a pe lese, ase a pe lenu, iyi a pe lara*.

Kabiyesis, the Adominasi of Idominasi, Osun state, the Ebumawe of Ago-Iwoye, the Elepe of Epe, the Alaperu of Iperu, the Ewusi of Makun, the Limeri of Awa, the Odofin of Soyindo, the Onijagba of Ijagba, the Negbuwa of Ibedo, the Legusen of Ilupeju, the Onirolu of Irolu, the Onijoku of Ijoku, the Aminishan of Oko, the Lowa of Batoro, the Raniken of Iraniken, the Fadesewa of Simawa and all other royal fathers present, please accept my sincere appreciation; *ade a pe lori, bata a pe lese, ase a pe lenu, iyi a pe lara*

I must also not fail to acknowledge the presence of some of the very

important personalities such as Chief Adegboyega Onigbinde, Admiral (rtd.) Toye Sode, the former military governor of Oyo state, *Otunba* Yinka Lawal-Solarin, *Otunba* (Mrs.) Sodipo, Chief and Chief (Mrs.) Yomi Awodipe, Senator Mojisoluwa Akinfemiwa (an upright and distinguished political leader), Professor Biyi Afonja, the beloved immediate past Pro-Chancellor of our great University, *Otunba* Wole Odusanya, Mr. Adesanya, Mrs. Ogunjobi, *Olotu* Oyedele, *Omoba* Olu Dada, Mr. Obasola Ogunsanya, *Otunba* Ogunjobi, Mr. Paul Idedia, Prof. S. O. Onakomaiya, Prof. Layi Fagbenle, the legendary Jimi Solanke (*Baba Agba*), Barrister Adenowo, and others at this ceremony.

I am most grateful to my employers, the distinguished Chairman and members of the Governing Council of the University not just for retaining me as a staff in this era of 'clean-up', but for also honouring me with their unprecedented attendance of this lecture. This University and indeed the entire people of Ogun state are fortunate to have these patriotic and visionary lady and gentlemen on board to re-position our University for greater attainment. Posterity will surely put you at the zenith of positive contributions to this citadel of learning. I therefore acknowledge with thanks, the presence of: *Otunba* (Dr.) Alex Onabanjo the Pro-Chancellor and Chairman of the Governing Council, Mr. Fola Adeola, mni, OFR, Dr. B. A. Akinyemi, Prof R. A. Bello, Mr. Sina Kawonise, Hon. Olayide Odusanya, Chief Duro Otesanya, Engr. P. B. Oyebolu, Dr. Gboyega Salami, Prof. A. A. Gbolade, Mr. O. O. Olusanya, Princess Iyabo Odulate, Mr. Kayode Sunmola and Mr. Y. A. Ogunrinde.

In a similar vein, I give kudos to our 'due process' Vice-Chancellor, Prof Olusoga Sofola, FAS, for accepting to head the University at this stage of purification. May the good Lord continue to be your strength.

I thank: the foundation Vice-Chancellor, Prof. Olubi Sodipo (of blessed memory) for encouraging me to take up an appointment with the

University and for being my mentor on University administration; Prof T. O. Bamkole, the ideal University teacher for developing me; Prof Olatunji Oyeyeye, the innovative Vice-Chancellor, for allowing me to discover my administrative potentials; Prof Layi Ogunkoya for encouraging me to give my best to the Faculty since I became the Dean; Prof Afolabi Soyode, the most celebrated Vice-Chancellor, for supporting me tremendously to turn my Faculty from obscurity to leadership position; and Prof Tola Osilesi, for supporting my Faculty to consolidate its prominence.

I equally wish to express my profound gratitude to Dr. Akin Ogunlewe, FFS; Engr. B. Odufuwa, FFS and Prof. E. A. Fayose, GCFS of the Faculty Advisory Council for bequeathing a lasting legacy for the Faculty.

My colleagues in the Faculty deserve a special applause for their absolute confidence in my leadership and unflinching support in the last four years as the Dean of the Faculty. Specifically, I thank Professors Kehinde-Phillips, Victor Awoderu, Wale Ogundero and Tunji Amusa for their support while acknowledging the assistance of Prof. Sam Bankole, Drs. Laide Lawal, Joseph Ashidi, Mustapha Usman, Messrs Olumide Adesanya, Tayo Banjoko and all the members of staff in the Dean's and Faculty offices towards the success of this ceremony.

To my academic elders-uncle Bayo Oduneye, Professors Segun Odunuga, A. Abioye, A. Amusa, Dipo Oduye, Doris Afejuku (my lovely senior), Kayode Dada, Drs. Olubajo, Soladoye and Olowe I say God bless you.

Finally on the home front, I thank my father, Engr Tunde Jaiyesimi and my mother, Mrs Oluremi Jaiyesimi (of blessed memory) for giving birth to my wife and for being wonderful parents to me. I equally appreciate the entire Jaiyesimi family for accepting me as one of them. A good wife according to the scriptures [43] 'is worth more than rubies'. The late sage and the

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Between Poison and Prosperity (We le rurun kurun)

architect of educational emancipation in Nigeria, Papa Obafemi Awolowo once described his wife, Mama Hannah Idowu Dideolu Awolowo as a 'Jewel of inestimable value'. Mr. Vice-Chancellor Sir, kindly permit me to describe my wife Yetunde Olajumoke Ogunsanwo (popularly called Mrs. YOO) as an Extra Benevolent Gift (EBG) from God. EBG, I thank you and the children: Ayotunde (Papa), Babatunde (Baba) and Yetunde (Mama) for your unparalleled love and care.

To all of you very distinguished members of the audience I say:

(*wen ni rurun kunrun ri e daa naiye wen o*)

THANK YOU

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