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LEAD CONTENT OF VEGETABLES AND TOMATOES AT EREKESAN MARKET, ADO-EKITI

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Lead content of Leafy vegetables and tomatoes were determined for over a period of four months i.e. March - June, 1993 at Erekesan Market in Ado-Ekiti. The samples were taken at four different locations. The result shows a higher lead content for the samples taken along the major roads when compared with the samples taken few meters away from the major roads. Lead concentration in tomatoes was generally higher than in vegetables at each location.

Key words: Lead, Vegetables, Tomatoes.

Introduction

Lead is ubiquitously distributed throughout the environment and is invariably present in human and animal diets [1]. One of the major routes for environmental lead exposure is the deposition of particulates from leaded gasoline [2]. Leaded paint has also been reported as an important source of lead exposure in the environment. This has been reported as a serious threat to children's health in most industrialized societies throughout the world [3,4].

Investigations have shown that the amount of lead in the atmosphere and accumulation of lead in vegetation grown along highways depends on the motor vehicle traffic density, distance from the road, exposure time and external plant characteristics [5-7].

The exposure risk due to lead contaminated dust and soils has mainly focussed on large urban areas where dilapidated housing is present and traffic volumes are high [8]. It has also been reported that residents of smaller cities are generally faced with lower lead burden because large tracts of run-down housing are lacking and traffic volumes are low [9].

The decline in average blood lead levels in the United States from 1976 through 1980 was shown to be highly correlated with the reduction in use of leaded gasoline [10]. Billick *et al* [11]found that declining blood lead levels among children screened in Chicago and New York were correlated with declining air lead levels; however, both the overall decline and summer increases in blood lead levels were even more highly correlated with the amounts of leaded gasoline sold in each city.

More than any other age group, pre-scholars are especially prone to lead exposure through a propensity both for pica and enhanced hand-to-mouth contact. Elevated lead levels in children can be associated with behavioral problems, losses in intelligence and other neurological disorders [12,13].

In United States, multiple studies have demonstrated a clear correlation between low-level lead exposure during early development and deficits in neuro behavioral cognitive performance that manifest later in childhood [14]. These deficits, including IQ deficiency, behavioural disorders and impaired hearing, have been associated with blood lead levels as low as 10 µg/dL (0.48 µmol/L) [15]. As a direct result, in October, 1991 the Centres for Disease control and prevention (CDC) published guidelines on the level of blood lead (B-P-B) thought to be toxic, reducing the standard from 25 µg/dL (1.21 µmol/L) to 10 µg/dL (0.48 µmol/L), thus redefining childhood lead poisoning [16]. This decrease in the designated toxic level has significantly increased the number of children who are now considered to be lead poisoned. Furthermore, results from longitudinal studies have demonstrated that the negative effects of lead on cognitive function are persistent across cultures, racial and ethnic groups, and social and economic classes [17].

As lead contamination of the environment has serious effects on the health of man, it is a matter of great importance for food hygienists and health authorities to have reliable information on the lead content of our food stuffs at any point in time for corrective measures. This is the basis of this work.

Ado-Ekiti is one of the major towns in Ondo state where industrial activities are increasing at a high rate. Erekesan Market is situated along the major road through heart of the town. The motor traffic is moderately high and industrial activities are well represented.

Materials and Methods

Sampling. The sampling of the leafy vegetables and tomatoes were carried out over a period of four months that is March, April, May and June, 1993. The samples were as far as possible, taken at four different locations at Erekesan

TABLE 1. LEAD CONCENTRATION IN VEGETABLES FROM DIFFERENT LOCATIONS AND DISTANCE (PPM, DRY MATTER)

Types of vegetable	Distance from major road (m) (A) 0 - 2	(B) 5 - 10	(C) 15 - 25	(D) 15 - 25	Sampling date
Solanum macrocarpon	0.50	-	0.10	-	March,1993
Ammaranthus caudatus	0.40	-	0.05	0.30	"
Grass caphahum	0.43	-	0.13	-	"
Corchorus olitorius	-	ND	-	0.35	"
Telfaria occidehtatus	0.40	-	-	-	April,1993
Solanum macrocarpon	0.45	-	ND	-	"
Telinum triangulase	0.48	-	-	0.32	"
Vernomia Anydalia	-	0.12	ND	-	"
Calosia argentes	-	-	ND	0.30	"
Ammaranthus caudatus	-	-	-	0.20	"
Cucurbita pepo	-	0.10	-	-	"
Corchorus olitorius	-	0.15	-	-	"
Solanum macrocarpon	0.40	0.15	-	-	May, 1993
Cucurbita pepo	0.40	0.10	-	-	"
Corchorus olitorius	0.43	-	-	0.30	"
Telfaria occidentatus	-	-	0.10	-	"
Talinum triangulare	-	-	0.13	0.34	"
Vernomia anydalia	-	-	ND	0.31	"
Celosia argentea	-	0.13	-	-	"
Solanum macrocarpon	0.40	-	0.12	-	June,1993
Ammaranthus caudatus	0.45	-	0.05	0.30	"
Grass caphalum	0.43	-	ND	-	"
Corchorus olitorius	-	0.13	-	0.35	"
Vernomia anydalia	-	0.0	-	0.31	"
Ammaranthus hybrids	-	ND	-	-	"
Mean	0.43	0.12	0.10	0.31	
S.D.	0.04	0.02	0.03	0.04	
C.V.	0.09	0.17	0.30	0.13	

ND = Not Detectable.

TABLE 2. LEAD CONCENTRATION IN TOMATOES FROM DIFFERENT LOCATIONS AND DISTANCES (PPM DRY MATTER)

Types of tomatoes	Distance from major road (m) (A) 0 -2	(B) 5 -10	(C) 15 -25	(D) 15 -25	Sampling
Lycopersicum escucentum (Yoruba)	4.00	1.80	2.00	3.40	March,1993
Lycopersicum escucentum (Hausa)	3.00	2.25	3.25	3.60	"
Lycopersicum escucentum (Yoruba)	3.75	1.50	1.70	2.90	April,1993
(Hausa)	4.00	2.00	3.00	3.10	"
Lycopeersicum escucentum (Yoruba)	4.00	NS	1.90	1.80	May, 1993
(Hausa)	4.10	NS	3.30	1.95	"
Lycopersicum escucentum (Yoruba)	3.70	1.60	2.00	3.00	June, 1993
(Hausa)	3.00	1.80	1.70	3.10	"
Mean	3.69	1.83	2.36	2.86	
S.D.	0.45	0.27	0.70	0.65	
C.V.	0.12	0.15	0.30	0.23	

NS= No sampling.

Market in Ado-Ekiti.

The four different locations are represented as A, B, C, D, in which A is along the major road side, B is between 5 - 10 m from the major road, C is between 15 - 25 m from the major road while D is of the same distance from the major road as C, but almost 40 m apart horizontally from location C. At each location the samples were purchased at random from 5 - 6 retailers to represent a pooled sample.

Procedure. The samples of the leafy vegetables were cut into pieces, air-dried before drying at 80°C for four hours. About 10 g of the dried material was then powdered in a hammer mill. The sample of the tomatoes (berry) were homogenized with an ultra-turrax and the homogenized material dried at 80°C for four hours. About 2.50 g of the dried material was then powdered in a hammer mill. 1.0 g and 0.5 g of the powdered vegetable and tomatoes, respectively, were weighed into a separate container and ashed in a muffle furnace at 450°C, the ash was evaporated with 6 M HCI and digested thoroughly with a mixture of conc. H_2SO_4 and conc. HNO_3 in the ratio 2:5 ml. 4 ml of conc. H_2SO_4 and 10 ml of HNO_3 were employed in this digestion.After the completion of the digestion, 15 ml of distilled deionized water was added followed by the addition of sufficient ammonia solution to bring the pH to 3 for quantitative extraction. 2 ml of 2% ammonium pyrrolidine dithiocarbamate was then added to a 50 ml aliquot of the digest solution. This was then allowed to stand for five minutes for lead chelation to occur.

The mixture was then extracted with 10 ml of 4 methyl pentan-2- one. The extracted ash was then filtered into a volumetric flask and the filter washed with hot water. These extracts were analysed by atomic absorption spectrometry using a Perkin-Elmer 305 A spectrophotometer [18]. Because of dominant matrix effects, the analyses were carried out by the method of standard addition [18]. All the reagents employed in this analysis were of analytical grade. A blank containing all the reagents without the samples was carried through the entire process. This was used to set the instrument at zero. This is expected to have eliminated any contribution from the material used.

Results and Discussion

The lead concentration in vegetables and tomatoes sampled (at different locations and distances from major road) for analysis are as shown in Tables 1 and 2, respectively.

From Table 1, lead concentration ranges from 0.00 - 0.50 ppm of the dry matter for vegetables while from Table 2, it

ranges from 1.50 - 4.00 ppm of the dry matter for tomatoes.

In agreement with results published in other countries like Norway and Central Europe, the present investigation shows that the vegetables and tomatoes along the major road have a higher lead content the those ones few meters away from the major road. This might be due to a high traffic density along the major road. The lead concentration in tomatoes is relatively higher than in vegetables, at each location, this could be due to the fact that the market women usually (at interval) dip the vegetables into water to prevent dryness. During this process, some of the lead deposited on the vegetables might have been washed off thereby reducing the lead concentration. Also it has been reported that the differences in mineral content of plant products might be due to the soil compositions and the rate of uptake of minerals by each plant [19]. Some other factors like climatic, geographical relative to the growth area of materials determined may contribute to lead concentration variation.

The Food Regulation [20] set a limit for lead of 3 ppm for apples and pears, 10 ppm for dried herbs and 2 ppm for other vegetables. As far as lead concentration in the vegetables and tomatoes is concerned, the present investigtion indicates that in tomatoes, the WHO/FAO's (1973) provisional tolerable weekly intake of 3 ppm lead for adults, may at time be exceeded by extensive consumption of these materials. This may not be the case where the lead concentration are relatively below the tolerable daily intake. The relation between lead concentration and the distance from the roadside was statistically tested using F-test; no significant differences were found in lead concentrations between the samples from various distances and locations at 95% confidence limit.

It is advisable to always wash thoroughly the product bought along the major roads as some of the lead content could be due to contamination from aerial deposition.

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