Advances in Life Science and Technology
ISSN 2224-7181 (Paper) ISSN 2225-062X (Online)
Vol 32, 2015

Analysis of Heavy Metals in Selected Cigarettes and Syrupy Tobacco (Mu`assel) Brands Smoking in Baghdad Market Iraq

Faliah Hassan Ali Al-Jeboori[1] Khalil Ibraheem Hussain[2] Azhar Sadiq Hammode[2] Duraid Eesa Znad[1]
1.Ministry of Science and Technology, Baghdad. Iraq
2.College of Education – Ibn- Al-Haitham, Baghdad University, Iraq
* E-mail of the corresponding author: Faliah _ali@yahoo.com, Khalil _ ih 53@yahoo.com or Azhar_hp@yahoo.com & dre72ad@yahoo.com

Abstract
Smoking related diseases can be attributed to the inhalation of many different toxins including heavy metals which have a host of detrimental health effects. The current study reports the levels of cadmium (Cd) , Nickel (Ni), cupper(Cu), Iron(Fe), Zinc(Zn) and lead(Pb) in cigarettes and syrupy tobacco(Mu` assel)obtained from Baghdad – Iraq Markets.The mean concentrations of Cd,Ni,Cu,Fe,Zn and Pb were (26),(0.29),(0.42),(1000),(45.3)and (0.26) ppm repectively .There were some differences in metal concentrations of cigarette brands producted by different manufacturers suggesting differences in the source of tobaccos used by different companies . For (Ni) , there were significant pairwis differences between Aspin and Al AMASE (Bountry) Mu` assel brands. For (Fe)AlAmase (Bountry)Brands had higher levels than Pine brands. Levels of (Cd) and (Pb) did not differ significantly across manufacturer group. Beacouse of the varity of toxic heavy metals in different brands of cigarette tobacco and their numerous negative health effects metal content in cigarette tobacco should be reduced.
Keywords: Metal, Toxicity, Tobacco, smoking, Mu`assel

1. Introduction

The consumption of tobacco products and number of smokers have been increasing steadily all over the world. The use of cigarettes constitutes one of the major causes of morbidity and mortality in the world, In the tobacco plantation herbicides, insecticides , and fungicides are used to control the various parasite and plant diseases. Tobacco smoke has toxic, geuotoxic, and carcincgenic properties. As a result of centaining both 4000 identified organic and inorganic human carcinogenic compounds [1] .

The exposure level to metals such as Cd , Cr , Pb and Ni in the smoke drawn from a single cigarette is small and likely not acutely toxic but their accumulation in tissues and fluids body over months , years and decades of exposure is depending on clearance rates and a health concern [2,3,4,5].
This is a particular issue for cadmium (Cd) and lead (Pb), which have long (10-12 year) half-lives in the human body.

Biomonitoring studies showed substantially higher Cd and Pb levels (6,7,8) .Human toxicity of Pb is made complex by its multiple valence states with non – satistactorily characterized in tobacco smoke [9,10].

The objective of the present study were many fold:

First, to investigate the heavy metal concentrations in different brands of tobacco cigarettes sold and/or produced in Iraq; second to find out if there are significant differences between different cigarette brands in their heavy metal contents ; thirds :to compare our data with the other published articles of others parts of the world.

2. Experimental

2.1. Materials and Instruments

Sample collection:_Seventeen different brands of cigarettes and syrupy Tobacco (Mu`assel) were purchased from different market fig (1,2), composite samples of each brand were made by removing the papers and filters of five cigarettes taken randomly from a pack of 20 cigarettes and five cigarettes from each pack of the same brand with different batch numbers were mixed together.

2.2. Digestion procedures:

Two oxidation procedures were considered to bring the solid sample to liquid from which can be measured by atomic absorption spectrometry (AAS) techniques.

First procedure

The mean weight of each cigarette brand was determined by weighing 5g sticks of each brand before and after removing the paper wrappers .The same weight of each Mu`assel sample was taken.

The samples were dried in an over at 90 c° for 1hr and allowed to cool in desicators five grams of each cigarette sample were ached at 500 °C in amuffle furnace. One gram of each of ash and row cigarettes were differently treated with a mixture of concentration HNO_3 and HCL acid in a ratio of 1:3 and heated to near

dryness. The digest was filtered through whattman filter paper into a volumetric flask and made up to volume with distilled water. The later was analyzed for heavy metals (Pb, Cd, Ni, Cu, Zn and Fe) using an atomic absorption flame emission spectrophotometer phonex company. A standard reference material was prepare to validate method**.**

Second procedures

The samples were dried in an oven at 105 °C. The dried cigarette were pound using mortar and pestle and sieve with mesh sieve. About 1 g of ground tobacco cigarette was weighed into a clean 125ml flask. Amixture of 4ml of HCl, 25ml Conc. HNO_3 and 2ml Conc. H_2SO_4 was added.

The resulted mixture was heated gently on a hot plate under a fume-hood for 30 min .The flask was allowed to cool and 2ml of Conc. HNO_3 was further added. The mixture was finally heated strongly to a medium heat for 3 minutes and allowed to cool .The solution was completely filtered (using whatman no. 42 filter 9cm)into 100 ml volumetric flask and make up to the mark with distilled water.The filtrate solution was stored in the refrigerator waiting for heavy metal analysis using AAS.

Results and discussion

Heavy Metal Content in Cigarettes and syrupy Tobcco (Mu`assel)

Figure (1): shows the averaged element concentration in duplicated wet digested samples in ppm for each of the seventeen cigarettes and syrupy tobacco brands sampled. Iron (Fe) was observed to higher in the brand AL-AMALE (bountry flavor) and the lowest level was observed in pin cigarette at 0.06 ppm.

Zinc was observed to be highest in the brand AL-AMALE (bountry flavor) at 90.1ppm and the brand Aspin have the lowest (Zn) concentration of 0.53 ppm Dw

Cupper (Cu) maximum level of 1 ppm and minimum level of ≈0.037 , 0.060 ppm was observed in the brands muzay A French tabacco (AL FAKHER two apples and ALFAKHER gum with mint) respectively

The brand ASPIN and Miami have the lowest and highest level of Ni detected respectively.Pb concentration was observed to be higher in the brand ALFAHER (orange) at 0.429 ppm. while the lowest level was observed in the brand pin at 0.1ppm Cd detected in the brand ALAMASE(BAGHDAD NIGHT)with 0.49 ppm and in pin with 0.03 ppm . Level of Cd detected for all brands. The mean concentration of each of these trace metals studied was also determined Fe, Zn, Cu, Pb, Ni and Cd averaged 325.428, 13.234, 0.3046, 0.2414, 0.3779 and 0.115176 respectively (table 1).

Though the minimum levels of Cd and Pb were observed in one of the high priced cigaretts brand PIN and ASPIN sold in Baghdad market. The claim by same smokers that only the cheep priced cigarettes brands increase their body burden has been disproved by the highest concentration of Cd found in brand ALAMASE(Baghdad night) . From this fact no brand is considered to be safer than another.

However from literature the amount of trace metals in cigarettes and levels depends several factors including the variety and origin of the plants. Compared to the present study , Jung (1998) [11] reported higher concentration for metals except for lead (Pb) that was about ten times higher in the present study compared to 1.35ppm and 0.74 ppm obtained for Korean and United Kingdom cigarettes respectively .

The result obtained for Jordanian cigarettes does hot compare well with the present study etal (2005). Although Pb was reported lower .Also the work of Nnrorom [12] and Nwankwo [13] etal (1977) who individually reported lower levels for Cd in developing countries companied to developed countries corroborate with the present study.

Variation among studies could be due to earlier observation that heavy metal content of cigarettes varied largely with region of production for all the elements of interest determined in this work. the levels obtained do not differ much between the brands except for Iron (Fe) and (Zn).Iron (Fe) concentration in mu `assel the brands ALFAKHER different type and ALMMASE difference type differs largely; about hundred times higher than in the cigarettes, in differs brands zinc concentration in the mu `assel brands (ALFAKHER and ALMASE) A is about ten times higher than cigarettes in deferent brands analyzed.

The trace metal content established in the smoke emanating from the burning cigarette (i.e. the total trace metal content obtained through wet digestion minus the trace metal content in the ash) is reported in (Fig1).

The amount of (Fe)2000 ppm , (Zn)90.1ppm , (Cu)0.815 ppm , (Pb)0.429 ppm, (Ni)0.925 ppm and (Cd) 0.489 ppm delivered into the total smoke was observed to be highest in brand (ALAMASE Bounty Flavour) , Royale ,ALFAKHER (orange), Miami and ALAMASE(Baghdad night) respectively (Fig 2).

The lowest concentration of these metals were observed in the brand pine , aspin, capital, (aspin and pine), aspine and pine at (Fe 0.06 ppm), (Zn 0.53 ppm) , (Cu 0.02 ppm) , (pb 0.1 ppm) , (Ni 0.06 ppm) and (Cd 0.03 ppm) respectively . No substantial difference was observed for all element in the tested brands of cigarettes.

Of most importance in this work and for smokers is the amount of metals in the mainstream smoke (i.e.

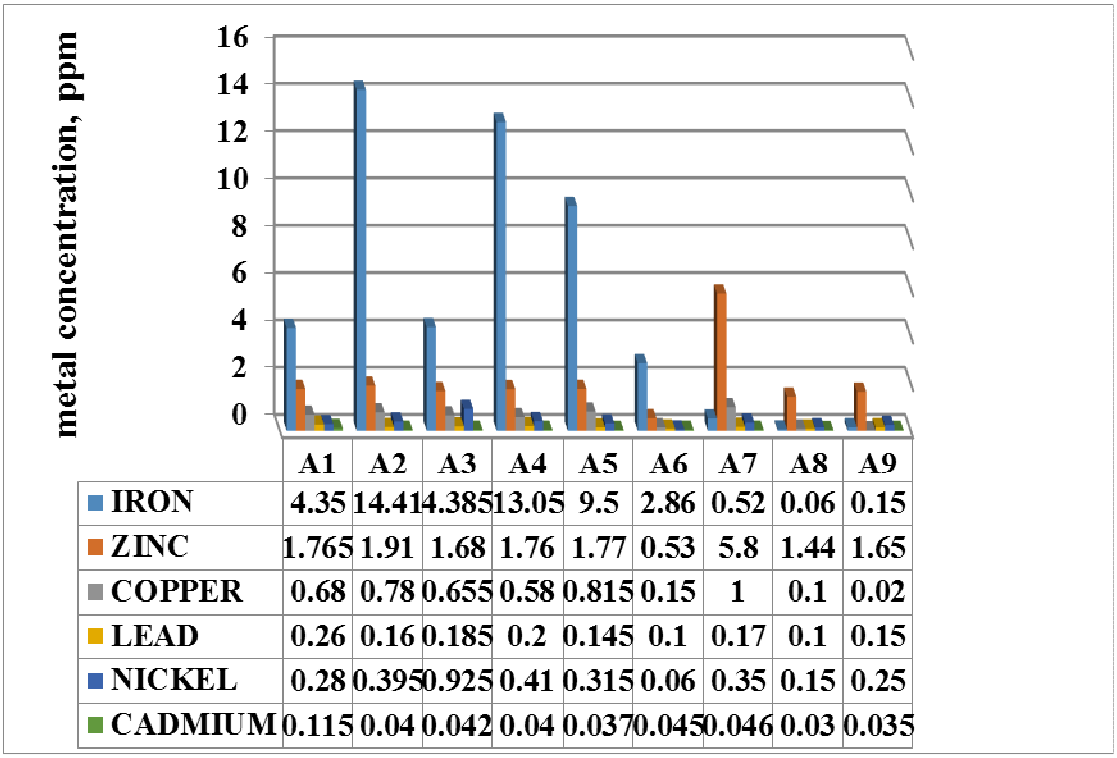
smoke that passes through the filter into the smokers system). Approximately 0.1 µg Cd was estimated to be passed into the mainstream smoke, with a daily intake of 2.0 µg for a smoker of 20 sticks of cigarettes, the estimated levels especially 2mg for a smoker of 20 sticks of Iraq cigarettes was higher than the less than 0.1 mg (Cd) and daily intake of 1mg for a smoker of 20 sticks of German filter cigarettes. Another study shows that this cigarettes is known to display higher Cd level and lower Pb level. this corroborates the works of oladipo etal (14) who showed high similarity of German cigarettes to Nigerian cigarettes, in most common elements except for Cd and Pb which exhibit higher and lower levels respectively. Lead estimated to range between 0.1 mg -0.429 mg passes into main stream smoke. there is a relationship between the amount of lead inhaled in Nigerian cigarettes with those inhated in Korean 0.4 mg-1.19 mg and United Kingdom 0.22mg-0.65 mg reported by Jung eta[11].
From the result of our work an average of 25% of Cu, Ni and Zn contained in the tested cigarettes was assumed to be passed into mainstream smokes. Thus base on this, a daily in take of 0.304 (0.02-0.815)mg of Cu and 0.45(0.53-90.10)mg Zn was estimated to be passed into mainstream smoke.

5. Conclusion

The concentration of heavy metal trace elements in brand cigarette commonly smoked in Iraq have been determined. the levels of metals especially those with lexicological effects estimated in smoke can cause adverse health effects among smokers .

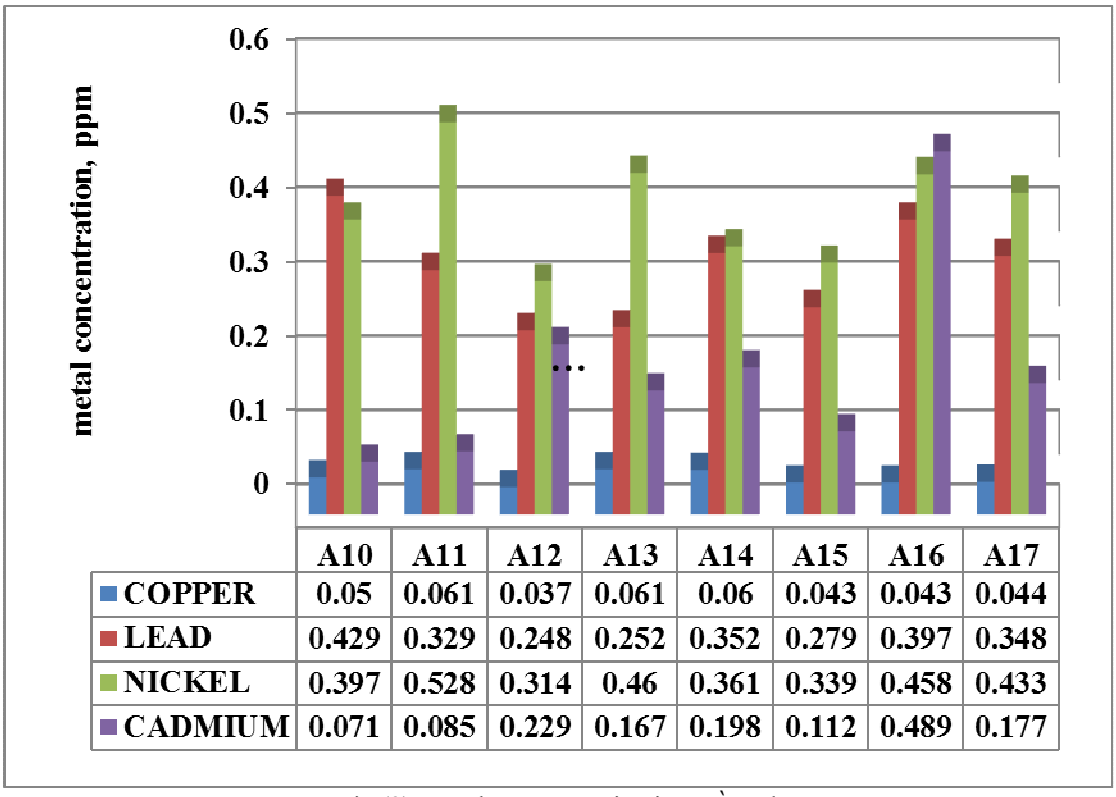
People subjected to environmental tobacco smoke are at higher risk of contracting cigarette smoking health related disease

The synergistic action of trace metals on certain vital organs in the body is responsible for numbers of complications such as paralysis strokes, atherosclerosis, and peripheral arterial disease among others.



	A1	A2	A3	A4	A5	A6	A7	A8	A9
IRON	4.35	14.41	4.385	13.05	9.5	2.86	0.52	0.06	0.15
ZINC	1.765	1.91	1.68	1.76	1.77	0.53	5.8	1.44	1.65
COPPER	0.68	0.78	0.655	0.58	0.815	0.15	1	0.1	0.02
LEAD	0.26	0.16	0.185	0.2	0.145	0.1	0.17	0.1	0.15
NICKEL	0.28	0.395	0.925	0.41	0.315	0.06	0.35	0.15	0.25
CADMIUM	0.115	0.04	0.042	0.04	0.037	0.045	0.046	0.03	0.035

Figure (1): Metals concentration in cigarette brands



	A10	A11	A12	A13	A14	A15	A16	A17
COPPER	0.05	0.061	0.037	0.061	0.06	0.043	0.043	0.044
LEAD	0.429	0.329	0.248	0.252	0.352	0.279	0.397	0.348
NICKEL	0.397	0.528	0.314	0.46	0.361	0.339	0.458	0.433
CADMIUM	0.071	0.085	0.229	0.167	0.198	0.112	0.489	0.177

Fig (2): metals concentration in Mu`assel

Table (1): Metals concentration in cigarette brands and Mu`assel.

	IRON	ZINC	COPPER	LEAD	NICKEL	CADMIUM	
A1	**4.350**	**1.765**	**0.680**	**0.260**	**0.280**	**0.115**	**Aspin silver**
A2	14.410	1.910	0.780	0.160	0.395	0.040	gitanes
A3	4.385	1.680	0.655	0.185	0.925	0.042	miami
A4	13.050	1.760	0.580	0.200	0.410	0.040	gauloises
A5	9.500	1.770	0.815	0.145	0.315	0.037	royale
A6	2.860	0.530	.0.150	0.100	0.060	0.045	Aspin blue
A7	0.520	5.800	1.000	0.170	0.350	0.046	kent
A8	0.060	1.440	0.100	0.100	0.150	0.030	Pine
A9	0.150	1.650	0.020	0.150	0.250	0.035	capital
A10	125.000	7.170	0.050	0.429	0.397	0.071	alFakher (orange)
A11	2000.000	90.100	0.061	0.329	0.528	0.085	alAmase (bounty flavour)
A12	720.000	23.700	0.037	0.248	0.314	0.229	Mazaya(a French tobacco)
A13	143.000	15.200	0.061	0.252	0.460	0.167	alAmase (gum fusion flavour)
A14	358.000	9.120	0.060	0.352	0.361	0.198	alAmase (sulttani)
A15	624.000	23.800	0.043	0.279	0.339	0.112	alFakher (two apples)
A16	646.700	14.690	0.043	0.397	0.458	0.489	alAmase (Baghdad night)
A17	866.300	22.900	0.044	0.348	0.433	0.177	alFakher (gum with mint.)

References

1- International Agency for Research on cancer(IARC)tobacco smoking,IARC Monograph 38,International Agency of Research on cancer,lyon,france,1986.
2- Dorne,I.L.;Kass,G.E.;Bordajandi,L.R.;Amzal,Bertelsen,U.;Castoldi; A.F.;Heppner,C.;Eskola,m.;fabiansson,s.;Ferrari,p.;etal Met Ions life sci.2011,8,27-60.
3- Pappas,R.S. Inflammation and sensitization metallomics 2011,3, 1181-1198.
4- Stojanovic, d., Nikic,D.,Lazarevic,K., J.Public Health2004,12,187-189.
5- Calazyn-sidorczuk ,M., Brzoska M.M.,Moniuszko - Jakoniuk , J., Environment assess.2008,137,481-493 .
6- Richter,P.A., Bishop,E.E., Wang,J.,Swahn ,M.H., (1999-2004). Int. J. Environ. Res. Public Health. 2009,6,1930-1946.
7- Tellez-Plaza , M., Navas-Acien,A. , Caldwell, K.L. , Menke , A. , Muntner , P., Guallar , E., 1988-2008 ; the

contribution of declining smoking rates.Environ . health perspect 2012 , 120,204-209.
8- Marano , K.M., Nautal , Z. S., Kathman, S.J., Bodnar, J.A.,
Borgerding , M.F., Garner , C.D., Wilson , C.L., Biomarkers and risk assessment Regul Toxical. Pharmacol.2012,64,243-52.
9- Serdar , M.A., Akin, B.S., razi C., Akin, O., Tokgoz , S., Kenar,L., Aykut , O., Trace Elem.Res.2012.148,11-17.
10-Liu , C., wright , C.G., McAdam , K.G., Taebunpakul,S., Heroult , J., Braybrook , J.,Behrage Zur Tabakforschung International(Contrib . tob . Res.) 2012,25,375-380.
11- Jung , M.C. , thmton, I. , and chon , H.T.,1998 Environmental Technology 19(2):237-241.
12- Norom ,I.C., Osibanjo , O., and Oji-NNorom , C.G.,2005.Africant Journal of Biotechnologh 40(10):1128-1132.
13- Nwanko , J.N., Elinder , C.G.:Piscator , M. and lind, B.1977. Zambian Journal of science and technology 2:1-4.
14- Oladipo.Mo.A.,Aiayi , O.O. , Eleqba , S.O. , Alonge , S.O., and Adeleye , S.O., 1993 . Journal of Environmental science and health A.28:839-857.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar