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Research Article

Determination of heavy metals in some Cigarettes and *cannabis sativa* available in Nigeria

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Abstract

The distribution of heavy metals content in cigarette and cannabis were determined using atomic absorption spectrometers (Model Unicam 929). The result showed that the concentration of metals in cannabis are Pb 0.028, Cu 0.0172, Fe 0.0380, Cd 0.0263 and in cigarette samples, the metal concentrations for sample A are Pb 0.0172, Cu 0.0123, Fe 0.0254, Cd 0.0103; For sample B, Pb 0.0132, Cu 0.0132, Fe 0.0263, Cd 0.0151; and sample C, Pb 0.00, Cu 0.0132, Fe 0.0232, Cd 0.0094. The result obtained revealed that metal concentration in cannabis samples exceeded those of cigarette samples. Therefore both cannabis and cigarette are dangerous to health but cannabis seems to be more dangerous to health.

Keywords: cigarette, *Cannabis sativa*, heavy metals, Nigeria

INTRODUCTION

Heavy metals are those that in their standard state have a specific gravity (density) of more than about 5g/cm^3. Some of them are essential in very low concentrations for the survival of all forms of life and are described as essential trace elements. Only when they are present in greater quantities is toxic (Abdulla and Chmielnicka, 1990).

Increasing industrialization has been accompanied throughout the world by the extraction and distribution of mineral substances from their natural deposits. Following concentration, many of these have undergone chemical changes through technical processes and finally pass, finely dispersed and in solutions, by way of effluent, sewage, dumps and dust, into the water, the earth and the air and thus into the food chain(Abdulla and Chmielnicka, 1990).. Cigarette is one of the means by which nicotine in tobacco is made available for human consumption. Nicotine is recognized to be the major inducer of tobacco dependency (Wiersema, 1990). Usually, cigarette is made up of tobacco; paper and additives as much as 600 – 1400 additives are used in cigarette manufacture, with many of these additives containing trace elements (Ebisike et al., 2004).

Cigarette smoke contains particles and gases generated by the combustion of its various components at high temperature. More than 4000 compounds have been identified in environmental tobacco smoke (Kleeeman, 1999). The cigarette smoke can be inhaled directly by the smoker and non-smokers in cigarette-contaminated environment through passive smoking. Cadmium is a known carcinogen and is one of the components of tobacco. It has been proved quantitatively that exposure to cigarette smoke is harmful to both active and passive smokers (Shaham, 1996). observed that exposure to cigarette smoke via active and passive smoking increases blood Cd by an average of 0.01µg% over the background (unexposed non-smokers).

Cannabis sativa (Indian Hemp Plant) plant, which grows in the mild climate, in many parts of the world, is mentioned in a Chinese herbal, dating from about 2700 B.C (Omoruan, 1989). The crude drug can be obtained from leaves, flowers, seeds and stem of hemp, Marijuana is the common name for a crude drug made from the plant Cannabis sativa. The

main mind-altering (psychoactive) ingredient in marijuana is THC (delta-9-tetrahydrocannabinol). It can be smoked in cigarettes or pipes and can be snuffed or added to food (Muoboghare, 2003). The effects of cannabis sativa vary, depending on the strength and amount of the drug consumed. Some immediate physical effects of marijuana include a faster heartbeat and pulse rate, bloodshot eyes, and a dry mouth and throat. Tobacco consumption had been linked to high incidence and gravity of cardiac disease (Kasimu, 1982).

Sample collection

Different brands of cigarettes sample were obtained from Sabon Gari market and were coded as A, B and C and the cannabis sativa sample was collected in a washed plastic container from a local area in (Dan Agundi quarters, Municipal L.G.A Kano state).

Sample preparation

The tobacco cigarette samples was dried in an oven at 90°C for 1hr and allowed to cool in desiccators and ashen in a muffle furnace.
The cannabis sativa samples was kept in the sun and dried for three days in flat white plastic material. After drying, the sample of cannabis leaves and seed was weighed and crushed to smooth particle with a mortar with pestle.

Moisture content

The fresh tobacco cigarette sample was weighed (W_1) on a pre weighed paper (W_0) and ashen in a muffler furnace. The ashen sample was cooled in a desiccator until constant weight was obtained (W_2) and calculated the % moisture using the equation.

$$\%\, moisture = \frac{W_1 - W_2}{W_1 - W_0} \times 100\%$$

Ash content

The fresh tobacco cigarette sample was weighed (W_1) on a pre weighed paper (W_0) and ashed in a muffler furnace. The ashen sample was cooled in a desiccator until constant weight was obtained (W_2) and calculated the % moisture using the equation.

$$\%\, ash = \frac{W_2 - W_0}{W_1 - W_0} \times 100\%$$

Determination of Metals Concentration in Cigarette samples

One gram of each ashen tobacco cigarette sample was treated with a mixture of 2M HNO_3 and HCl acid in a ratio of 1:3 and heated to near dryness. The digest was filtered through filter paper into a volumetric flask and made up to 250ml with distilled water. The sample solution was analyzed using Atomic Absorption Spectrophotometers (Unicam 929).
Determination of Metals Concentration in Cannabis sample
One gram of the cannabis leaves and seed sample was placed in digested flask. Thereafter, the sample was treated with a mixture of 2M HNO_3 and HCl acid in a ratio of 1:3 with constant stirring. The digests were placed on hot plates for some minute before transferred to the fume cupboard where it kept overnight. On cooling, the digests was filtered and made up to the mark in 100ml volumetric flasks using deionized water. The sample solution was analyzed using Atomic Absorption Spectrophotometers (Unicam 929).

RESULT AND DISCUSSION

From the procedure carried out in this research project it has been reported that different samples have different and metals concentrations as well as moisture and ash contents respectively as shown from the tables below.

Table 1. Concentrations of metals in cigarette and *cannabis* samples in ppm

Sample	Pb	Cu	Fe	Cd
A	0.0172	0.0123	0.0254	0.0103
B	0.0132	0.0132	0.0263	0.0151
C	0.00	0.0132	0.0232	0.0094
Cannabis	0.028	0.0172	0.0380	0.0263

Table 2. Moisture and ash content

Sample	% Ash	% Moisture
A	0.1720	0.1678
B	0.1505	0.1769
C	0.1720	0.0687

DISCUSSION

The heavy metals found in the samples vary in concentrations, some are higher and some are lower than the threshold values of various organizations such as world health organization (WHO, 2010), national agency for food and drug administration and control National Institutional Drug Abuse (1990) and Standard Organization of Nigeria (2005).

The concentration of Pb in excel cigarette sample was found to be 0.0172mg/L which was higher than the threshold value given by World Health Organisation (1992) 0.01mg/L, and the threshold value given by[7] 0.01mg/L and the threshold value given by [10] 0.01mg/L. The concentration of Cd in excel cigarette sample was found to be 0.0103mg/L which was also higher than the threshold value given by World Health Organisation (1992) 0.003mg/L, and the threshold value given by National Institutional Drug Abuse, 1990 0.003mg/L and the threshold value given by Standard Organization of Nigeria, 2005 0.003mg/L.

The concentration of Cu in excel cigarette sample was found to be 0.0123mg/L which was below the threshold value given by (World Health Organisation, 1992) 0.5-2.0mg/L and the threshold value given by National Institutional Drug Abuse, 1990. 0mg/L and the threshold value given by Standard Organization of Nigeria (2005) 1.0mg/L. The concentration of Fe in excel cigarette sample was found to be 0.0254mg/L which was below the threshold value given by World Health Organisation (1992) 1-3mg/L, and the threshold value given by National Institutional Drug Abuse, 1990 0.3mg/L and the threshold value given by Standard Organization of Nigeria (2005) 0.3mg/L.

The concentration of Pb in aspen cigarette sample was found to be 0.0132mg/L which was higher than the threshold value given by World Health Organisation(1992) 0.01mg/L, and the threshold value given by National Institutional Drug Abuse, 1990 0.01mg/L and the threshold value given by (SON, 2007) 0.01mg/L. The concentration of Cd in aspen cigarette sample was found to be 0.0151mg/L which was also higher than the threshold value given by World Health Organisation (1992) 0.003mg/L, and the threshold value given by National Institutional Drug Abuse (1990) 0.003mg/L and the threshold value given by Standard Organization of Nigeria, 2005 0.003mg/L.

The concentration of Cu in aspen cigarette sample was found to be 0.0132mg/L which was below the threshold value given by Standard Organization of Nigeria (2005) 0.5-2.0mg/L, and the threshold value given by National Institutional Drug Abuse (1990) 1.0mg/L and the threshold value given by Standard Organization of Nigeria(2005) 1.0mg/L. The concentration of Fe in aspen cigarette sample was found to be 0.0263mg/L which was below the threshold value given by World Health Organisation(1992) 1-3mg/L, and the threshold value given by National Institutional Drug Abuse (1990) 0.3mg/L and the threshold value given by Standard Organization of Nigeria(2005) 0.3mg/L.

Concentration of Pb in standard cigarette sample was found to be 0.00mg/L, which was lower than the threshold value given by World Health Organisation (1992) 0.01mg/L, and the threshold value given by National Institutional Drug Abuse(1990) 0.01mg/L and the threshold value given by Standard Organization of Nigeria

(2005) 0.01mg/L. The concentration of Cd in standard cigarette sample was found to be 0.0094mg/L which was higher than the threshold value given by[11]0.003mg/L, and the threshold value given by National Institutional Drug Abuse(1990) 0.003mg/L and the threshold value given by Standard Organization of Nigeria(2005) 0.003mg/L.

The concentration of Cu in standard cigarette sample was found to be 0.0132mg/L, which was below the threshold value given by World Health Organisation (1992) 0.5-2.0mg/L, and the threshold value given by National Institutional Drug Abuse(1990) 1.0mg/L and the threshold value given by Standard Organization of Nigeria(2005) 1.0mg/L. The concentration of Fe in standard cigarette sample was found to be 0.0232mg/L, which was below the threshold value given by World Health Organisation (1992) 1-3mg/L, and the threshold value given by National Institutional Drug Abuse(1990) 0.3mg/L and the threshold value given by Standard Organization of Nigeria(2005) 0.3mg/L.

The concentration of Pb in cannabis sample was found to be 0.028mg/L, which was higher than the threshold value

given by World Health Organisation(1992) 0.01mg/L, and the threshold value given, by National Institutional Drug Abuse(1990).01mg/L and the threshold value given by Standard Organization of Nigeria(2005) 0.01mg/L. The concentration of Cd in cannabis sample was found to be 0.0263mg/L, which was higher than the threshold value given by World Health Organisation (1992) 0.003mg/L, and the threshold value given by National Institutional Drug Abuse (1990) 0.003mg/L and the threshold value given by Standard Organization of Nigeria(2005) 0.003mg/L.

The concentration of Cu in standard cigarette sample was found to be 0.0172mg/L, which was below the threshold value given by World Health Organisation (1992) 0.5-2.0mg/L, and the threshold value given by National Institutional Drug Abuse (1990) 1.0mg/L and the threshold value given by Standard Organization of Nigeria(2005) 1.0mg/L. The concentration of Fe in cannabis sample was found to be 0.0380mg/L, which was below the threshold value given by World Health Organisation (1992) 1-3mg/L, and the threshold value given by National Institutional Drug Abuse(1990) 0.3mg/L and the threshold value given by Standard Organization of Nigeria(2005) 0.3mg/L.

CONCLUSION

The concentrations of heavy metals in cigarette and cannabis available in Kano Nigeria have been determined. Cigarette and cannabis have considerable concentrations of heavy metals with toxicological effects. Some are below while some are higher than the threshold limit, and people subjected to cigarette and cannabis smoking and environmental cigarette smoke are at the risk of contacting cigarette and cannabis smoking health related diseases.

RECOMMENDATIONS

Health practitioners, teachers as well as parents should see this as a task that must be done to create awareness in the minds of the society on the health implication of cannabis and cigarette smoking.

Government and society should enlighten people about the adverse health effect of cannabis and cigarette smoking and provide job opportunities to youth because most of these smokers are youth.

Prohibition of smoking in some areas (administrative) to tackle the effect of passive smoking

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