IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

IMPACT OF BRICK KILNS ON THE SOIL QUALITY OF CHHOHATA BAZAAR, DISTRICT AKOLA

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Abstract:

Brick making is one of the growing industries of India which had great contribution in the development of country. In order to meet the demands of urbanization the industry's production rate is also increasing. This has lead to the combustion of enormous amount of coal and other materials thus deteriorating the quality of environment. Brick kilns in developing countries are considered as one of the important source of pollution. Heavy metals are one of the reported pollutants from brick kilns and are highly persistent, non-biodegradable in nature and are serious threat to the environment.

The aim of the current study was to assess the level of heavy metals in the soil around six selected brick kilns sites in Chhohata Bazar, District Akola. The concentrations of heavy metals in the soil were determined by using AAS. The investigated concentrations of heavy metals in soils were compared with the WHO standards.

It was found that the concentrations of all studied metals were below the permissible limits especially at agriculture soil located adjacent to brick kilns.

The results of study showed that brick kilns have great potential of deteriorating the quality of environment so; it is recommended that the monitoring of soil around brick kilns should be carried out on regular basis in order to develop control measures to prevent the impacts of heavy metals pollution.

Keywords: Brick Kilns, Threats, Prevention of the Impacts

INTRODUCTION

Soil in any environment whether rural or urban is considered one of the crucial components, subjected to pollutants coming from anthropogenic sources. The major anthropogenic sources include combustion of fuels in brick kilns, mining, smelting and municipal solid wastes. The outcomes of these anthropogenic sources are release of heavy metals. SOx , NOx , VOCs and COx in the environment(Ahmed and Erum, 2010; Resongles *et al*., 2014; An *et al*., 2014; Civan *et al*., 2015; Mahmoud and Abdel-Mohsein, 2015). The release of toxic heavy metals is of major concern in the area located adjacent to sources is release such as brick kilns. Soil pollution due to heavy metals has got serious attention in developing countries due to peculiar nature of heavy metals Abril *et al*., (2014). The studies show that heavy metals have deleterious impacts on environment due to their persistent nature (Sherene, 2010; Mathur and Kumar, 2013; Waoo *el*., 2014). Some of the heavy metals are mobile in nature which move from soil to plant and underground water circulating through entire food chain indirectly affecting the health of human (Blackman *et al*., 2006; Bigdeli and Seilsepour, 2008 ; Joshi and Kumar, 2011). The release of heavy metals from brick kilns have adverse effect on soil, plants and people residing near brick kilns especially women and elderly people are at greater risk from such pollutants. Agricultural Soils may also become polluted and growth and yield of the crops is affected.

Monitoring of environmental quality around brick kilns should be of prime importance. Regular monitoring can help to evaluate the extent or trend of pollution and can also suggest some controlling measures as well as possible remediation. Urbanization is one of the major factors in the development of country. In developing countries especially Pakistan with increasing speed of population the rate of urbanization is also increasing. In order to meet the demand of construction the number of brick kilns is also increasing in rural and outskrits of major urban areas. Millions tons of coal is being used annually for the production of billions of bricks (Skinder *et al*., 2014). The design of kilns, fuel characteristics and lack of complete combustion as well as concentration of pollutants in the form of flue gases (Bhanarkar *et al*., 2002; Blackman *et al*., 2006). The current investigation reports thee results from one year study conducted in the six brick kilns localities of Chohata Bazar, District Akola. The objective of the study was to investigate the impact of heavy metals pollution on the surrounding soil.

MATERIAL AND METHODS

Description of the study site: Six brick kilns sites (Takali (S1) , Nakhegaon(S2), Karodi(S3), Akola-Akot road(S4), Karodi -II(S5), Mahalakshmigaon (S6)) were selected for the current study. Brick kilns were selected on the basis of production capacity, functionality and nearness to the agricultural land.

Samples of soils (1.00 ± 0.001 g each) were placed into 100 ml beakers separately, to which 15 ml of tri-acid mixture (70% high purity HNO3, 65% HClO4 and 70% H2SO4 in 5:1:1 ratio) was added. The mixture was then digested at 80 _C till the solution became transparent (Allen et al., 1986). The resulting solution was filtered and diluted to 50 ml using deionized water and was analyzed for concentrations of Cd, Cr, Ni and Pb using an atomic absorption spectrophotometer (Model 2380, Perkin–Elmer, Norwalk, CT, USA). The measurements were made using a hollow cathode lamp of Cd, Cr, Ni and Pb at wavelengths of 288.8, 357.9, 232.0 and 283.3 nm, respectively. The slit width was adjusted for all the heavy metals at 0.7 nm. Standard solutions were frequently run to check the sensitivity of the instrument.

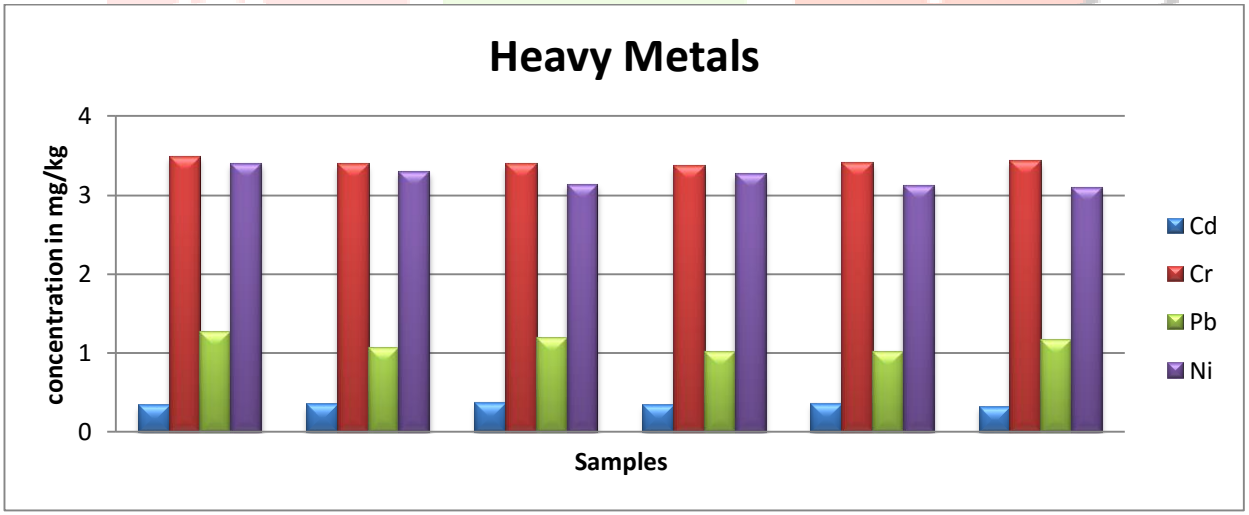
OBSERVATION TABLE:

Table 1: Metal concentration (mg/kg) in soil sample collected from Chhohata Bazaar

Sr. No.	Heavy Metals	Sample Concentration (mg/kg)						Mean
		S1	S2	S3	S4	S5	S6	
1.	Cd	0.339	0.344	0.369	0.340	0.363	0.314	0.344
2.	Cr	3.489	3.395	3.397	3.364	3.414	3.436	3.415
3.	Pb	1.266	1.071	1.183	1.013	1.019	1.166	1.119
4.	Ni	3.406	3.294	3.136	3.268	3.124	3.097	3.220

Table 2: Heavy Metals Standard for soil (mg/kg)

Sr. No.	Standards (mg/kg)	Cd	Cr	Pb	Ni
1.	Dutch Standard	0.80	100	85	35
2.	Canadian Guideline	1.4	64	70	50
3.	Australian Guideline	3.0	50	300	60



Graph 1: Heavy metal concentration (mg/kg) in soil sample collected from "Chhohata Bazaar"

RESULTS AND DISCUSSION:

According to Pangtey (2004) the Mean level of Lead i.e. 30.05 ppm are risky for the workers and also for their children who often play around brick kilns. During the study of Chohhata Bazar Lead concentration was found to be 1.00 – 1.300 in range. It was very less than harmful level.

Metals in soils were compared with the other studies in Bangladesh and other countries studied according to Proshad R (2017) the ranges of Cd, Cr, Pb, Ni, Cu and As in studied soils were 1.03–8.06, 0.77–21.71, 2.23–18.31, 4.74– 27.67, 3.08–38.56 and 2.51–28.44 mg/kg, respectively. During the study the range of heavy metals Cd, Cr, Pb and Ni were found to be in less quantity 0.314-0.369, 3.395-3.489 , 1.013-1.266 and 3.097 – 3.406 mg/kg (table no.1) respectively. The concentrations of Cadmium, Chromium, Lead and Nickel in present study were less than those of the study conducted in "Chhohata Bazaar".

The mean value of Cadmium concentration in Chhohata Bazaar was observed 0.344 mg/kg and (Ismail 2012) 2.88 mg/kg Cd concentration was found in Peshwar soil which is in higher concentration.

CONCLUSION:

After the analysis of soil samples taken from different locations in the proximity of the brick kiln area, a general conclusion that could be reached the heavy metal concentration is well within the Dutch, Canadian and Australian soil standards and guidelines. The level of heavy metals is very well within non-toxic limit for the workers and human settlement around brick kilns.

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