

Assessment of Heavy Metals in Poultry Feed of Hyderabad, Sindh

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Abstract: Food is very necessary for the human diet because it contains many carbohydrates, vitamins and minerals for the metabolism human life. Poultry is used worldwide as one of the food items and continuously growing throughout society. It is fact that the growth of poultry depends upon the feeds and that feeds contain different pollutants including heavy metals. This study investigated the concentrations of heavy metals; Lead and Chromium in chicken feed, obtained from commercial markets of poultry feed and local poultry farms of Hyderabad city. A total of eight samples of poultry feeds from which four were commercial feed samples and four were local feed samples collected in polyethylene bags. The samples were analyzed via Atomic Absorption Spectrophotometer (AAS) Aurora A11200 for heavy metals; Lead (Pb) and Chromium (Cr). Relatively higher concentrations of Lead (Pb) were found in commercial feed samples. The results obtained from the present study for lead and chromium above the permissible limit; i.e. 0.05 and 0.1ppm as prescribed by WHO/FAO. Lead (Pb) and Chromium (Cr) metals are essential for the growth of poultry but they may become toxic if the concentrations exceeded the permissible limits. Excess amount of metals uptake by animals find their way to the human body, very harmful to human health.

Keywords: Atomic Absorption Spectrophotometer, Bioaccumulation, Wet-acid digestion, and the European Union.

I. INTRODUCTION

Food is very necessary for the human diet because it contains many carbohydrates, vitamins and minerals for the maintains of human life. As a consequence of environmental pollution, the contaminants may enter the food chain. Due to natural and anthropogenic activities heavy metals spreading wide range adverse impacts and led to the release of toxic substances in the environment. The effluent coming out from the industries and leaching of rocks along with other causes have led to their release in an aquatic environment. Many scientists and researchers applied various methods to minimize the concentration of pollutants in aquatic environment including physical, chemical, and physicochemical and biological [1]. In the last three decades, the poultry industry is trying to provide economical, delicious and healthy food for urban populations. The poultry business is presently the biggest part of farming all around the world and is quickly expanding in South Asia too [2]. The consumption of chicken is rapidly increasing due to its economics cost as cheaper than mutton and beef and gives better dietary values for health benefits [3]. Due to the toxicity of heavy metals, pollution poses a severe risk to human health [4]. Normally, the metals are found in the earth's crust and their compositions change among various areas, resulting in spatial variations of surrounding concentrations. Metals can be defined as those substances which have high electrical conductivity, malleability, and luster, which freely lose their electrons to form cations [5]. The metals which having a specific density of more than 5 g/cm³ are known as heavy metals. Some heavy metals like; Cadmium, Lead, Arsenic and Chromium harmfully affect the environment and living organisms when in very high concentration [6]. Heavy metals are typical to sustain several biochemical and physical functions in living organisms when they in very low concentrations, however, these metals become very toxic when they exceeded the prescribed limits. Heavy metals exposure continues and is increasing in many parts of the world, even though it is accepted that heavy metals have many adverse health effects on human health for a long period of time [7]. Some heavy metals like chromium, lead, arsenic, cadmium, nickel, copper, and zinc found in large quantities in the ecosystem but can be detected in the small quantities in the water, fish, and birds, which cause risks for the human health and the environment [8]. To evaluate the risk associated with heavy metal exposure, many researchers have studying the concentration of metals in chicken and many other food items [9]. In Pakistan, the poultry industry has great importance, because it is one of the growing sectors of the livestock in Pakistan. According to Economy Survey 2018-19, Pakistan has become the 11th largest poultry producer in the world. The Poultry sector of Pakistan also provided many career opportunities and training (direct/indirect) to more than 1.5 million people. The effect on the amount and feed production due to the changing of poultry production in a controlled shed system. Presently there are 6,500 controlled environment poultry sheds in our country shows that the poultry sector is moving towards in the direction of progress by using advanced techniques [10]. The issue of heavy metals concentration in chicken feed and its meat remains a matter of concern for consumers. The most common heavy metals are; Lead, Chromium, Arsenic and Cadmium etc. In this study Lead and Chromium are taken as under.

II. MATERIALS & METHODS

Study Area: In this research work Hyderabad City is taken as Study Area. Hyderabad is comprised of four Tahsils (Regions) Old Hyderabad, Saddar, Qasimabd and Latifabad. **Sampling Collection:** Samples of poultry feeds were randomly collected from Feb - March 2019 from different poultry feed shops and local farms. Seven samples were collected from which two were commercial feed and five were local feed samples (Fig.a). The collected samples were in darkness and later analyzed for heavy

metals. Determination of heavy metals: The concentration of heavy metals; lead (Pb) and chromium (Cr) in poultry feed samples were determined to apply the standard procedure and using a double beam Atomic Absorption Spectrophotometer (AAS) Aurora A11200 instrument (Fig.b).



Fig a. Collection of Poultry Feed at Poultry Farms of City, Hyderabad



Fig b. Atomic Absorption Spectrophotometer (AAS)

All poultry feed samples were prepared by the method of wet-acid digestion [11]. Firstly, all the samples of poultry feed were made uniform separately. A known quantity, 2 grams of each sample was placed into the digestion flask, 10ml of HNO₃ (65%) pure was added and mixed well and similarly, 4ml of H₂O₂ (30%) was added. After mixing of solution, the mixture was kept in Fume Hood. The mixture of the solution was firstly heated on a hotplate at 250⁰C, then increasing the temperature slowly to about 300⁰C for 15 minutes, after the appearance of white fumes, digested samples were cool down. The samples were filtered using a Whatman filter paper No.14 then dissolved, in 20ml distilled water and again filtered. The filtrates were poured individually into 50ml pre-washed bottles and then analyzed on a Double Beam Atomic Absorption Spectrophotometer (AAS) Aurora A11200.

III. RESULTS AND DISCUSSIONS

The results of Lead and Chromium concentration in poultry feed is presented (Table.1 and Fig.1) and (Table.2 and Fig.2). The results are compared with standards. The obtained values of heavy metals are exceeded by the permissible limits.

Table 1. Concentration of Lead (mg/kg) in selected brands of feed collected from Hyderabad city

S. No	Sample Name	Sample Code	Observed Values of Pb (ppm)	*WHO/**FAO (0.05mg/kg)
1	Commercial Feed	CF1	0.495	0.05
2	Commercial Feed	CF2	0.485	0.05
3	Commercial Feed	CF3	0.462	0.05
4	Commercial Feed	CF4	0.415	0.05
5	Local Feed	LF1	0.313	0.05
6	Local Feed	LF2	0.465	0.05
7	Local Feed	LF3	0.389	0.05
8	Local Feed	LF4	0.662	0.05

*WHO = World Health Organization **FAO = Food and Agriculture Organization [12]

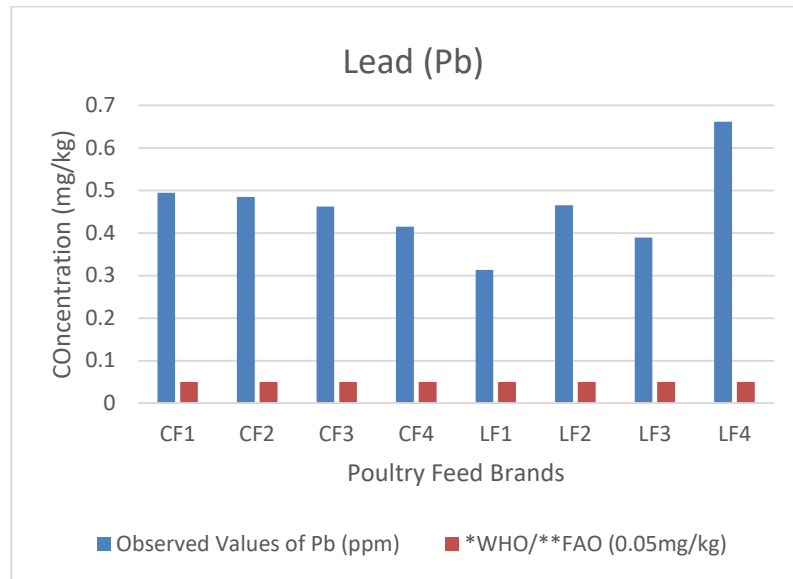


Fig. 1: Concentration of Lead (mg/kg) in selected brands of poultry feed samples in Comparison with Reference Standard

Table 2. Concentration of Chromium (mg/kg) in selected brands of feed collected from Hyderabad city.

S. No	Sample Name	Sample Code	Observed Values of Pb (ppm)	*WHO/**FAO (0.1mg/kg)
1	Commercial Feed	CF1	1.384	0.1
2	Commercial Feed	CF2	1.073	0.1
3	Commercial Feed	CF3	0.264	0.1
4	Commercial Feed	CF4	1.096	0.1
5	Local Feed	LF1	1.667	0.1
6	Local Feed	LF2	0.106	0.1
7	Local Feed	LF3	0.176	0.1
8	Local Feed	LF4	1.394	0.1

*WHO = World Health Organization **FAO = Food and Agriculture Organization [13]

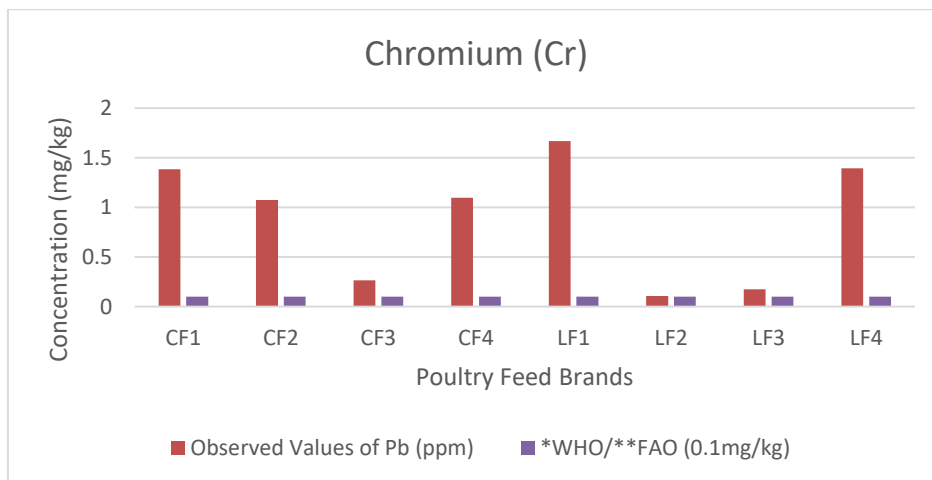


Fig. 2: Concentration of Chromium (mg/kg) in selected brands of poultry feed samples in Comparison with Reference Standard.

Table.3 Comparison of Observed Values with the other researchers work

S.#	Name of Researcher	Year	Heavy Metals Results	
			Lead (ppm)	Chromium (ppm)
01	Md. Simul Bhuyan et.al	2019	0.01 - 0.15	5.05 -1.45
02	Richard Alexis Ukpe	2018	1.17 - 0.071	0.529 - 0.061
03	Islam, M. S et.al	2007	20.65 - 0.601	5.7875 - 0.092
04	Arifuzzaman et.al	2016	-----	3.74 - 3.56
05	N Suleiman et.al	2015	0.55 – 0.01	-----
06	Imran et.al	2014	3.78 - 1.3	7.71 - 0.28
07	C. O. B Okoye et.al	2011	1.10 - 7.85	-----
08	Maheesar et.al	2010	33.6 - 3.8	-----
09	Alkhalaf et.al	2010	3.21 - 0.10	5.18 - 3.78
10	Islam, M. Shahidul et.al	2007	20.65 - 0.601	5.7875 - 0.092
11	Dahri.S et.al	2019	0.662 - 0.313	1.667 - 0.106

As shown in Table 3, the concentration of Lead (Pb) obtained in selected feed brands ranges 0.662 -0.313mg/kg and concentration of Chromium (Cr) with ranges 1.667 - 0.106ppm. However, the results of the current study exceeded the permissible limits of (WHO and FAO).

IV. CONCLUSIONS

Heavy metal pollution is prevalent in the district of Hyderabad and hence in present study poultry feeds are an alarming level. Therefore, the nutritive values of the feed as estimated from the concentrations of the Lead and Chromium above the permissible limit in the feeding stuff.

V. RECOMMENDATIONS

During the present study, it was found that locally made feed is relatively more contaminant as compared to branded feed. Contamination level of lead (Pb) and chromium (Cr) metals were found above the limit's standards. It is recommended that further extensive work may be carried out to detect other heavy metals in the chicken feed with other methods.

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