



تقدير تركيز ومقارنة العناصر الثقيلة في التوابل والبهارات من محلات مدينتي صبراتة وصرمان

أحمد بلقاسم إبراهيم¹ شادية سعيد كرير² حامد ابو عجيبة القمودي¹
عمران السراط³ راوية سالم الهادي² مسرة محمد الحبيب²

1- كلية العلوم، قسم الكيمياء، جامعة الزاوية 2- كلية العلوم قسم علم البيئة جامعة صبراتة 3- المركز النوعي للتدريب على الصناعات النفطية بالزاوية

ملخص الدراسة

في السنوات الأخيرة زاد الاهتمام بدراسة تلوث الأغذية بالعناصر الثقيلة نظرا لأنها تسبب العديد من الأمراض مثل الأمراض الرئوية والنفسية والاضطرابات الهرمونية والأمراض التناسلية. في هذه الدراسة تم تقدير العناصر (الزنك، الرصاص، الكوبلت و النحاس) في 5 أنواع من مسحوق التوابل (الفلفل الأحمر، البزار، كمون الحوت و الكركم والحرارات) الشائعة في الأسواق المحلية في مدينتي صبراتة وصرمان باستخدام مطيافية الامتصاص الذري (AAS) يناير 2021.

في هذه الدراسة وجد أن تركيز الزنك (0.8 – 14.5 ppm) وهي ضمن الحدود المسموح بها من منظمة الصحة العالمية 50ppm بينما كان تركيز الرصاص اعلى من الحدود المسموح بها عالميا ≤ 10 ppm في أغلب العينات المدروسة.

أما تركيز الكوبلت فكان أعلى من المسموح بها عالميا في عينة مسحوق الفلفل من مدينة صرمان (≤ 50 ppm). الارتفاع كان ملحوظ بشكل كبير جدا وذو دلالة إحصائية معنوية في تركيز النحاس في عينات الكركم والبزار من منطقة صرمان حيث وجد التركيز في كلا منها على التوالي (285.75 ± 93.6 ppm و 568 ± 249.6) واعلى بكثير جدا من الحدود المسموح بها من منظمة الصحة العالمية التي أوصت بان نسبة النحاس في التوابل يجب الا يتجاوز (50 ppm).

نستنتج من هذه الدراسة: ارتفاع في العناصر الثقيلة السامة في التوابل والبهارات والتي تستهلك بكثرة من قبل المواطن الليبي والتي تصبح غير امنة للاستهلاك ومصدر خطر على صحته.

الكلمات المفتاحية: العناصر الثقيلة، التوابل، الحدود المسموح بها عالمياً، التركيز والتلوث

Determination and comparison of heavy metals in spices from Sabratha and Surmanmarket's

Ahmad Ibrahim¹Shadia Krir²Hamed Alqamoudy¹Omran ALSarrat³Rawia Al hadi²Masarra Habib²

1- Faculty of Science, chemistry department, Al-Zawiya University

2- Faculty of Science, Department of Environmental Science, University of Sabratha

3- The Specific Center for Training on Petroleum Industries in Al-Zawiya

Abstracts

In recent years, food contamination by heavy metals has increased; it caused many diseases such as pulmonary and psychological diseases, hormonal disorders and venereal diseases. In this research, the elements (zinc, lead, cobalt and copper) were estimated in 5 types of spices powder like; Hotred pepper, Bezzar, Cumin, Turmeric and Al-harrarat which used as common additives to the food in Libya. Commercial spices powder were collected from Sabratha and Surmanmarket's and then the concentration of the heavy metals were measured by using atomic absorption spectroscopy (AAS) January 2021.

In this study, it was found that the concentration of zinc was (0.8-14.5 ppm), which is within the permissible limits of the World Health Organization 50ppm, while the concentration of lead and Cobalt (285.75 ± 93.6 ppm and 568 ± 249.6) respectively, which were higher than the permissible limits. In this study, the concentration of copper in spices samples from Sabratha markets was within the standard limit (50ppm). However, in this study the highest concentration (285.75 ± 93.6 and 568.4 ± 249.6 ppm respectively) of Copper was found in the Turmeric and Bezzar Surmanmarket's.

The results of the present study revealed that an increase in toxic heavy metals in spices, which are frequently consumed by the Libyan citizen, and which become unsafe for consumption and a source of danger to their health.

Keywords: Heavy metals, Spices, permissible limits, Concentration and contamination

Introduction

Environmental pollution is one of the most important problems affected by all countries of the world and has become a concern since the second half of the twentieth century, and many studies were done to resolved pollution problems around the world.As known, there are relationship between the human with his environment, then; Contamination in food, water, soil, air, has become a threat to the life and survival of all living creatures on the surface of the globe, primarily humans (Inam F, Deo S, Narkhede,2013). Heavy metals are among the most dangerous substances,

which introduce to plants and soil, and their danger lies in their remaining in the soil for a long period without decomposing or undergoing any chemical changes. Because of their presence in agricultural soil, it do not only affect plant growth, but also lead to contamination of grains and fruits eaten by humans (Manju, 2015). Spices are functional complementary foods that give foods a specific taste, color or flavor so that they do not affect the sensory taste of food (Mubeen H et al.,2009).Many studies and researches have confirmed that spices have positive properties on human health in general due to their contribution to the treatment of many chronic diseases such as cancer, diabetes and cardiovascular diseases (Rahman et.al 2020).Herbs and spices develop secondary metabolites that are part of the plants' chemical defense. Many of them have remarkable pharmacological and medicinal properties (Newman and Cragg, 2012).

As in most countries, the use of spices has recently increased in Libya . Particularly in the west region of Libya, the people traditionally consume significant quantities of spices. Although there is some information on the trace element and heavy metal contents of spices and herbal plants grown and consumed in Libya, the data available so far is not adequate or complete

The purpose of this research focused on estimating the of heavy metals (Cobalt, Lead, Cupper and Zinc) in some types of spices (red pepper, Cumin, Turmeric, Hot pepper,Bezzar and Al harrarat)collected from markets of Sabrathaand Surman cities and compared these concentrations to permissible limits by the World Health Organization.

Material and Methods

- Material

5types (30 sample) of common spices collected from the local markets (Sabratha and Surman) in January 2021. Their scientific and local names are as shown in Table 1. Samples kept in polythene

Common name	Scientific name	n=30
Turmeric	<i>Cuccuma longa</i>	6 sample (3from Sabratha and 3 Surman
Cumin	<i>Cuminumcyminum</i>	6 sample (3from Sabratha and 3 Surman
hot pepper	<i>Capsicum.spp</i>	6 sample (3from Sabratha and 3 Surman
Bezzar	Nill	6 sample (3from Sabratha and 3 Surman
Alhrarat	Nill	6 sample (3from Sabratha and 3 Surman

bags in a cool dry cardboard prior to analysis.

Table 1: Spice samples under investigation

Preparation of samples

All samples were placed in the oven at 80 °C for 2 hrs before digestion process (Marian et al., 2010). Instruments: metal measurement was performed with (Varian spectra 55B) Atomic Absorption Spectrophotometer, double beam and deuterium background correction. Measurement were done against metal standard solution.

Digestion procedure

The digestion method was carried according to method (Ang and Lee 2005):0.5g of dry powder samples was placed in flask and added to 4 ml of 35 % HCl and 12 ml of H₂SO₄ .The mixture was heated and the temperature was gradually increased to 100 C ° and left at this temperature for 2hr. The digestion process was repeated more than one time until a clear solution was obtained (ABM Helal et al.,2016). The clear solution was transferred into 25 ml volumetric flask, and completed to the mark with double distilled water. A blank digestion solution was made for comparison,

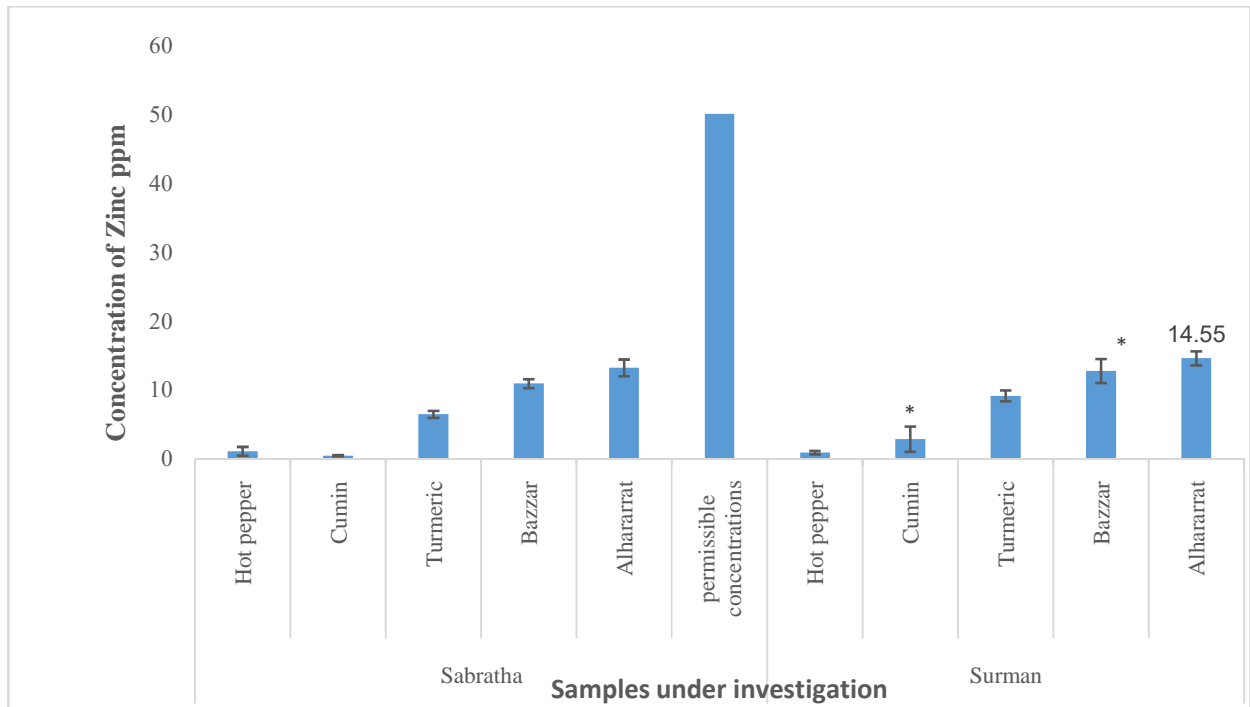
containing 4ml of 35% HCl and 12 ml of concentrated H₂SO₄, the solution transferred into 25ml volumetric flask and completed to the mark with double distilled water.

Statistical Analysis

Mean and Standard Deviation (SD) of the samples were determined using the statistical package for social sciences (SPSS) version 17 software package. Significance was accepted at 5% probability level. All the data reported in the Tables are average values of triplicate determinations.

Results

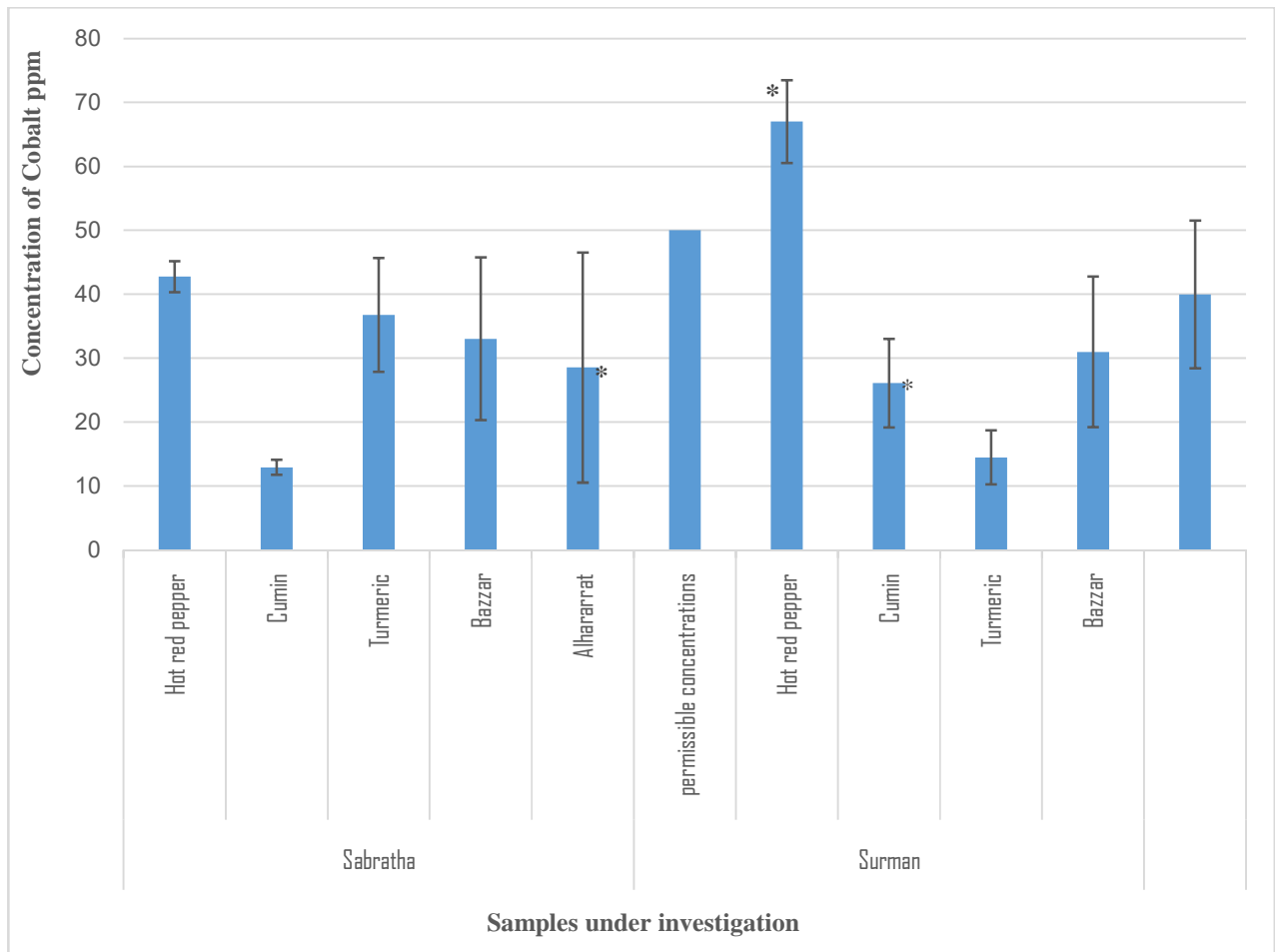
Figures from 1 – 4 shows the concentrations of the four microelements the concentrations of heavy metals in spices under investigation. World Health Organization 2005 showed that the permissible concentrations of (Zn, Co, Cu, and Pb) were 50, 50, 20, 10 ppm respectively.



Results presented as the mean of triplicates (\pm SD)

* significant at ≤ 0.05

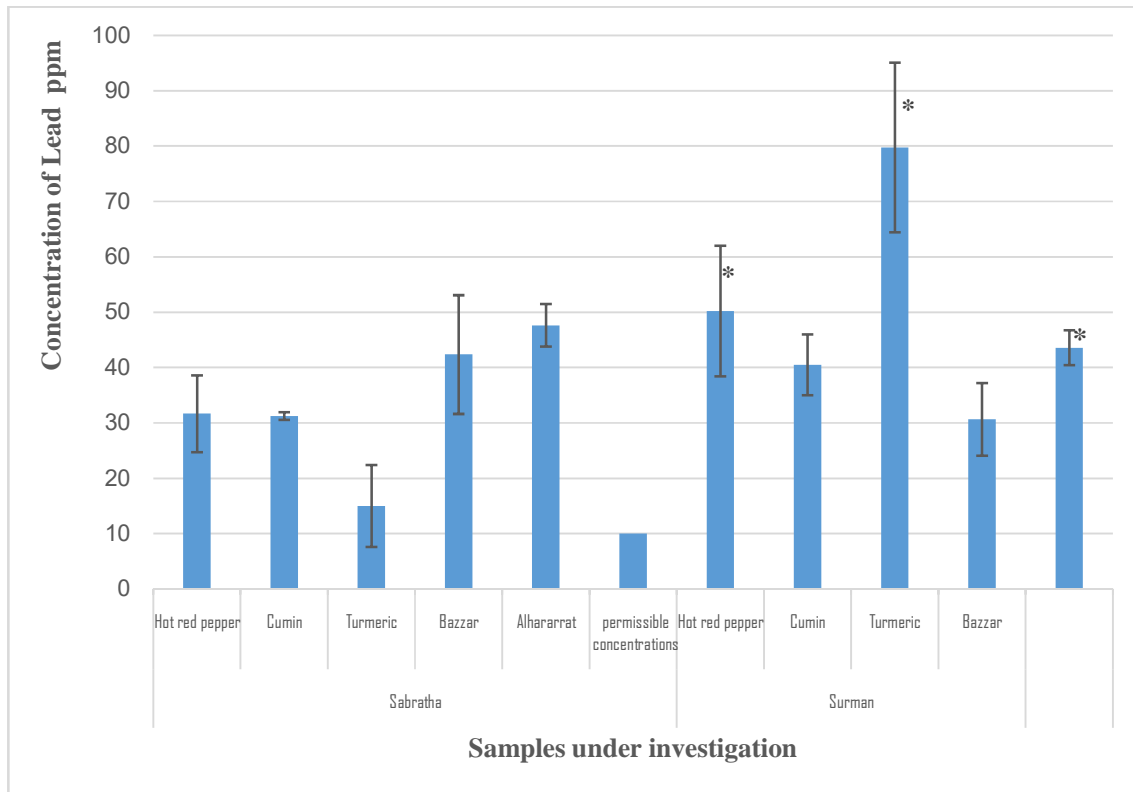
Fig.(1): Levels of Zn in different spices



Results presented as the mean of triplicates (\pm SD)

* significant at ≤ 0.05

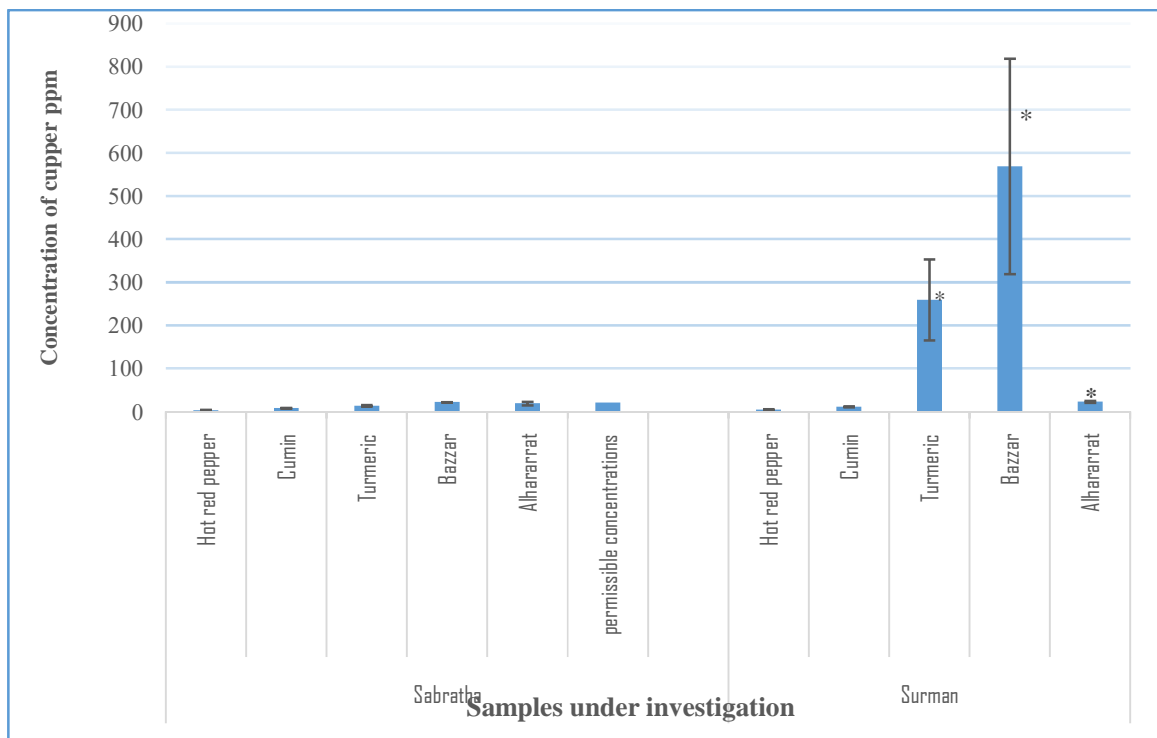
Fig.(2): Levels of Co in different spices



Results presented as the mean of triplicates (\pm SD)

* significant at ≤ 0.05

Fig.(3): Levels of Pb in different spices



Results presented as the mean of triplicates (\pm SD)

* significant at ≤ 0.05

Fig.(4): Levels of Cu in different spices

Discussion

The permissible zinc concentration of the World Health Organization does not exceed 50ppm.

It is clear that though there was variation in zinc concentration ($0.8 \pm 0.245 - 14.55 \pm 1.02$ ppm), therefore this result considered tolerable and in agreement with (Makanjuola et al., 2016). Zinc plays important roles in growth and human development (Colak, H et al., 2005, Darko, and Voegborlo 2014). It is known to be an important trace element as a cofactor for insulin (Kimani and et al., 2011). However, the accumulation of zinc in human body more than the preassemble limits causes health risk to consumers (Makanjuola et al., 2016).

Lead (Pb) is very toxic in metabolic process of plants and human (Wierzbicka, M 1999). Lead effects the red blood cells and causes damage to organs including the liver, kidneys, heart, and male gonads, as well as the immune system (M. Waziri¹, I. A. Adamu, 2012).

According to WHO, Pb concentration in all of the spice samples were above the limit in spices, there were significant difference ($p \leq 0.05$). This level tend to pose health risk to the consumers.

Generally, Cobalt concentration was within preassemble limit in all samples under investigation except hot red pepper was 68 ppm. While international limits 50 ppm. As known cobalt element has important role in biosynthesis of vitamin B₁₂ however, it will be toxic at elevated levels (Hifsa Mubeen et al., 2009, Weir et al., 1999).

In this study, concentration of copper in spices samples from Sabrathamarkets were within the standard limit limits (50 ppm). However, in this study the highest concentration (285.75 ± 93.6 and 568.4 ± 249.6 ppm respectively) of Copper was found in the Turmeric and Bezzar Surman market's. Other researchers also found copper value of turmeric, cinnamon, red pepper, black pepper, sumac, and dried mint lower than 40 mg/kg (Soylak M et al., 2004, Khan N. et al., 2014, Karadaş C, Kara D., 2012, . Ansari T. et al., 2004, Tokaloğlu Ş., 2012, Singh V, Garg AN., 2006). But, Ibrahim et al. (2012) reported copper value higher than the standard limit in sumac samples.

General, the geography, the geochemical soil characteristics, contaminants in the soil, water, and air, and addition to transport, and storage conditions can effect on the properties and the quality of the herbal plants (Saad B and et al., 2006).

Conclusion

Based on results in our research it can be concluded that the majority of the spices used in Sabratha and Surman cities were contaminated with heavy metals especially Lead and using of these spices could therefore pose a health hazard to consumers.

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