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DETERMINATION OF SOME SELECTED MINERAL COMPOSITIONS OF THE *CAPPARIS SPINOSA* PLANT FROM DIFFERENT EXTRACTS CULTIVATED IN ANBAR GOVERNORATE, IRAQ.

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Abstract
Capers, or Capparis Spinosa, are perennial shrubs of the family *Capparaceae* that are native to the regions around the Mediterranean Sea. This study's objective was to determine the mineral content of several *Capparis spino*sa plant extracts in the Al-Baghdadi area of the Anbar governorate. Atomic absorption spectrophotometer was used to determine the mineral concentrations of various extracts including capper crude. High concentrations of Fe, Ca, K, Be, Zn, and Na were present in all *capper* crude and was also present in all capper components. Additionally, the samples had extremely low concentrations of Cu, Cr, Mn, and Ni. Minerals Cu and Cr were found in all regions of plant extracts (0.8618 to 0.2099 ppm) and (0.5710 - 0.1001 ppm), respectively, and were plentiful in the majority of capper crude, ranging from 55,696 ppm in Fe to 580 ppm in Na. From 9,468 ppm in *capper* crude to 4,438 ppm in alkaloid extract precipitate, the amount of calcium varies. The alkaloid extract filtrate had to Be concentrations in the capper crude ranging from 668 ppm to 3,770 ppm. Compared to EEF, which has a sodium content of 150 ppm, AEF has a sodium concentration of less than 344 ppm. *Caper* pieces were shown to be significant suppliers of nutrients and vital elements as a consequence. Additionally, it is clear that caper pieces may be used as a dietary item to provide nutrition and are an excellent source of macro- and micro-minerals.

Keywords: Cpperisa Spinosa, minerals, heavy metal, AAS (AA-7000)

1. INTRODUCTION

Capparis Spinosa Long-lived shrub in the family Capparaceae. It grows naturally on all continents and in many different parts of the world, with more than 350 different types.[1] It is a plant that grows naturally in tropical and subtropical areas, but it can also grow in dry areas.[1,2] The caper plant is called bubu, gebre, gabar, gevil, kapari, keper, kebere, tursu otu, and sebellah in many parts of the world. It is a plant that can be used in business. The young shoots, flower buds, and fruit of the caper plant are all eaten by people. The caper plant has many uses in cooking. Different parts of the caper plant can be used as medicines, cosmetics, and food, and the whole plant can be used for landscaping, preventing erosion, and feeding animals. Since the 1980s, capers have been a very important crop in Spain and Italy.[1,3-5] Even though the numbers change from year to year, Spain, Morocco, and Italy are the top three countries that produce and/or export capers (approximately 10,000 tons).[1,6] The understanding of medicinal plants has its origins in early civilizations and cultures, and their main

objective is to employ their active ingredients to return the body to a condition of natural balance.[7] Additionally, traditional medicine uses the caper plant as an antiscorbutic, antispasmodic, tonic, and carminative agent against ulcers, diuretic, depurative, and vermifuge.[4,11–17] It is well accepted that herbs are significant mineral sources, and civilizations continue to use wild plants as a typical herb source to get relatively large levels of a variety of minerals.[17,18] Considering that this ancient plant is susceptible to salt stress throughout its primary growth phase, the introduction of a biostimulant may increase plant biomass, proline, soil enzyme activity, rutin bioflavonoid, and phenol content.[19] The ethanolic extract of Capparis spinosa (aerial portions) included alkaloids, glycosides, carbohydrates, tannins, phenols, and triterpenoids, while the aqueous extract contained alkaloids, steroids, carbohydrates, flavonoids, tannins, phenols, and saponins.[20]

The phenolic content of the fresh (1843.71 mg/100 g DW), fermented (1198.541539.49 mg/100 g DW), and berries (29.72-40.75 mg/100 g DW) was found to be higher than that of the latter. Quercetin-3-O-rutinoside, kaempferol-3-Orutinoside, and quercetin were the main phenolic components in the fresh and fermented buds.[21] Three extraction techniques—maceration, reflux, and ultrasonic extractions—were used to determine the phytochemical content and antioxidant activity of leaf extracts from Capparis spinosa L. The maceration extraction method showed the highest antioxidant activities using the reducing power assay, the azinobis (3-ethylbenzothiazoline)-6-sulfonic acid (ABTS+), and the 2,2-diphenyl-1-picrylhydrazyle (DPPH0).[22] Additionally, Capparis spinosa decreased inflammation in the brain and alleviated LPS-induced cognitive impairment. Additionally, C. Spinosa polarized inflammatory microglial cells towards M2 in vivo and LPS-induced M1/M2 unbalanced cells straight toward M2 cells in an in vitro experiment. Spinosa.[23] Despite comprising just 4-6% of the human body, dietary minerals are becoming more well-recognized for their importance. Scientists are able to qualitatively distinguish tiny amounts of certain mineral elements in living organisms. Trace elements found in living things may be essential for growth and health, unintentional reminders of our geological past, or markers of environmental exposure. Little is known about the mineral makeup of different parts of caper plants used as food and seasoning, such as young shoots, flower buds, caperberries (fruit), and seeds.[1,24,25] This study aims to identify the major and trace mineral content of several extracts from the wildcultivated Capparis Spinosa plant in the Anbar governorate of Iraq. These extracts include an aqueous extract, an alkaloid extract, and an alcohol extract.

2. MATERIALS AND METHOD

2.1. Plant material

The *Capparis* leaves were collected in 2022 from the AL-Baghdadi district in Anbar governorate, during the months of growth (May and June). The plant has been identified by the Desert Studies Centre at the University of Anbar for using in this study. The plant was washed and cleaned to remove all foreign objects and dried in the shadow at a laboratory temperature until it reached a stable weight, then kept in opaque and closed containers before the extraction.

2.2. Method

Determination of mineral contents

This experiment followed other descriptions with a few minor modifications. About 5 g of dried and powdered materials (crud and extracts) were added to a beaker, and 15 mL of pure HNO3 was stirred rapidly (at a speed of 40 rpm) for 1 hour at room temperature (60 C). The solution was filtered to get rid of the surface-adhered particles after being diluted with water to the necessary volume.[26] Concentrations were determined by Atomic Absorption Spectrophotometer (AA-7000) (AAS).

3. RESULTS AND DISCUSSION

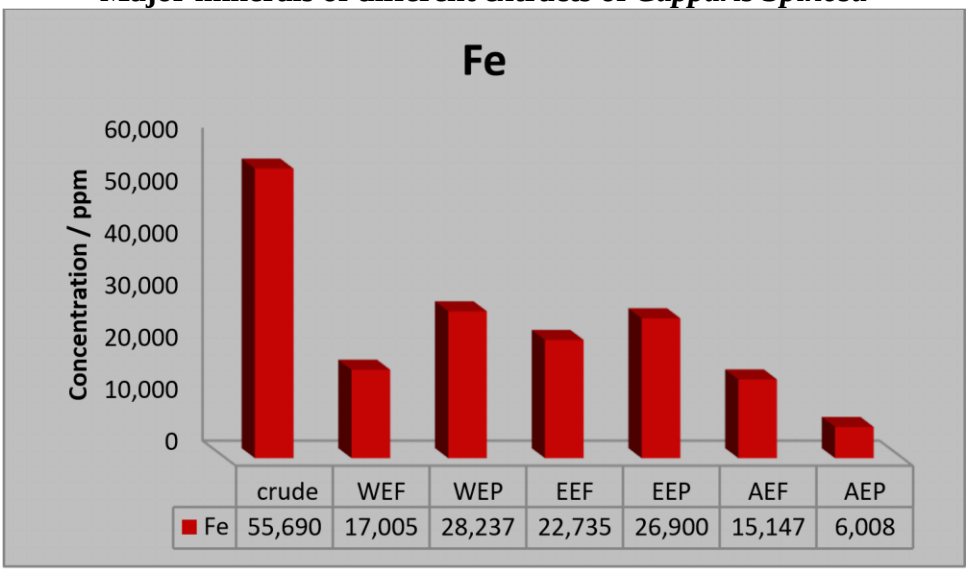
The mineral composition of various extract ingredients is shown in (Table 1). Nutritional values per 100 g of the ingested portion were calculated based on analytical results (dried weight). Depending on the various portions of the caper plant, it was discovered that the mineral compositions varied greatly in different extracts such as (water extract filtrate (WEF), water extract precipitate (WEP), ethanol extract filtrate (EEF), ethanol extract precipitate (EEP), alkaloid extract filtrate (AEF), alkaloid extract precipitate (AEP) and *Capparis* crude (Capp. Crude). All the components have very high concentrations of **Fe, Ca, K, Na, Be,** and **Zn**. The average **Cu, Ni, Cr,** and **Mn** content of capper organs was less than 5%, however, there were significant variations depending samples. Crude caper contains higher concentrations of all the parts of the caper plant. (Table 1). Additionally, it was determined that the primary minerals in all portions of *Capparis spinosa* include **Fe, Ca, K**, and **Be.** found in the minerals **Cu** and **Cr** of all parts of plant extracts (0.8618 - 0.2099 ppm), (0.5710 - 0.1001 ppm). **Ca** content high concentration of all parts from (9,468 ppm) in capper crude to (4,438 ppm) in alkaloid extracts precipitate. **Be** content varied from (3,770 ppm) in capper crude to (668 ppm) in alkaloid extract filtrate. When compared, the element **sodium** concentration ranges from (150 ppm in EEF) to less than to (range 344 ppm in AEF). Also, the elements of **zinc, nicke**l, and **manganese** contain different concentrations of some extracts in *Capparis spinosa*. Generally, the mineral contents of capper crude were found to be higher when compared with the results of different extracts of plants, especially capper crude has a rich concentration of all elements. These variations in the mineral composition of caper portions might be caused by synthesis circumstances, varieties, genetic variables, harvesting intervals, soil characteristics, etc.[27,28] The levels of Ca, Fe, K, Be, and Zn are suitable. The main building block of bone, calcium, aids in the growth of teeth.[29] The significance of these substances cannot be overstated since they are necessary cofactors for a variety of enzymes.[30,31] It has been discovered that caper parts including buds, fruit, and early shoots are significant providers of nutrients and critical components. Additionally, it is clear that caper pieces may be used as food ingredients to supply human nutrition and are rich suppliers of macro and micronutrients.

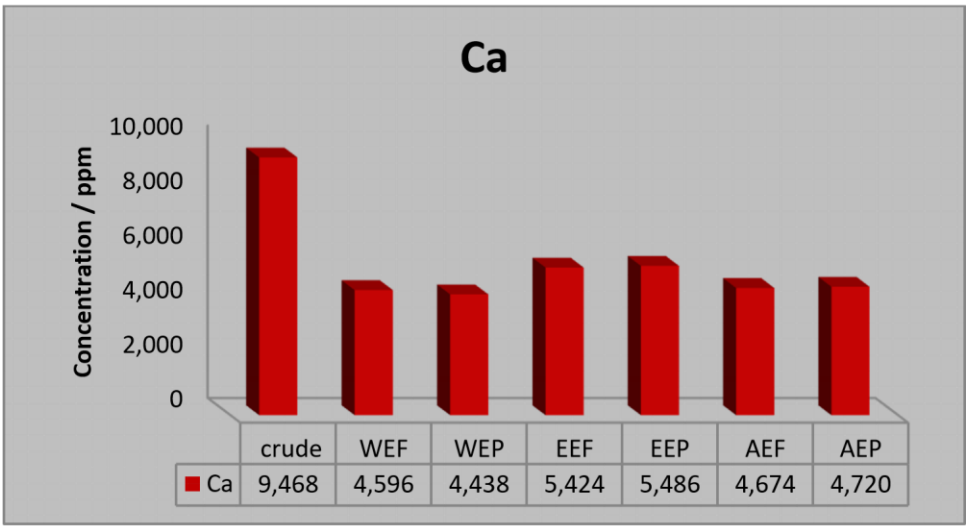
Table 1. The mineral content of various parts of *Capparis Spinosa*

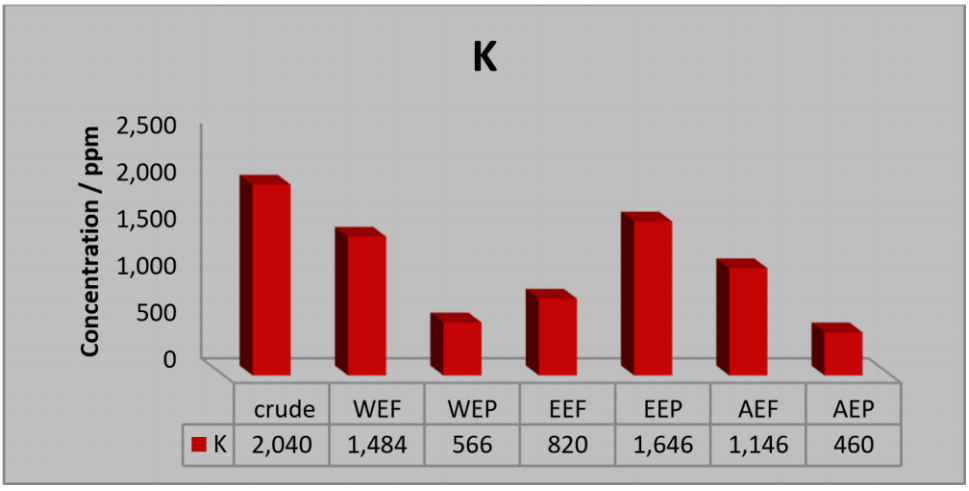
	Content/ ppm						
Minerals	**Capp. crude**	**WEF**	**.WEP**	**EEF**	**EEP**	**AEF**	**AEP**
Fe	**55.,690**	**17,005**	**28,237**	**22,735**	**26,900**	**15,147**	**6,008**
Ca	**9,468**	**4,596**	**4,438**	**5,424**	**5,486**	**4,674**	**4,720**
K	**2,040**	**1,484**	**566**	**820**	**1,646**	**1,146**	**460**
Na	**580**	**180**	**210**	**150**	**260**	**344**	**312**
Be	**3,770**	**2,532**	**1,994**	**3,146**	**2,726**	**994**	**840**
Cu	**0.861**	**0.209**	**0.685**	**0.685**	**0.446**	**0.561**	**0.255**
Ni	**4.002**	**1.525**	**3.190**	**2.188**	**2.603**	**3.515**	**1.79**
Cr	**0.571**	**0,100**	**0.448**	**0.161**	**0.315**	**0.389**	**0.297**
Mn	**3.029**	**1.578**	**2.036**	**1.692**	**1.815**	**2.011**	**1.348**
Zn	**31.188**	**23.964**	**27.366**	**28.729**	**29.966**	**18.609**	**10.131**

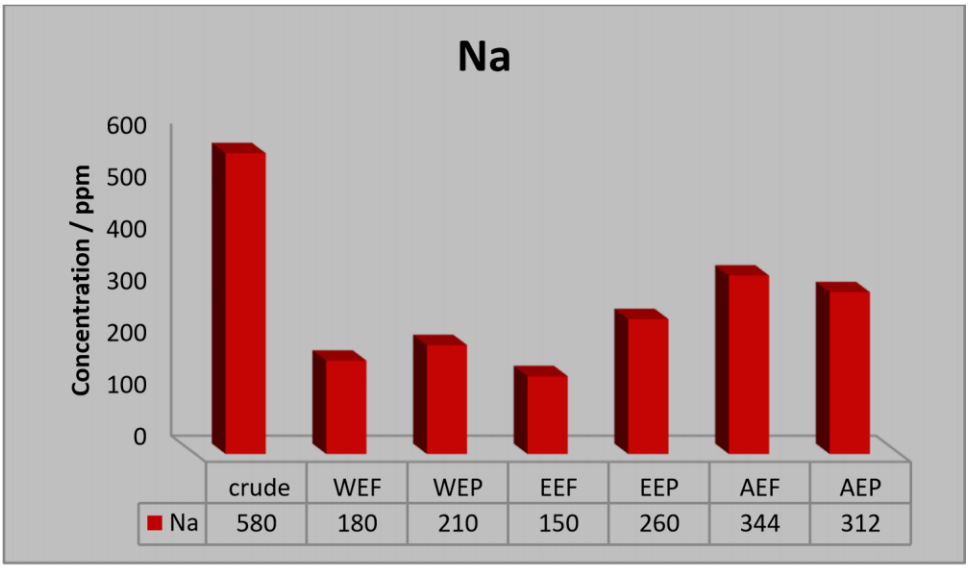
Figures

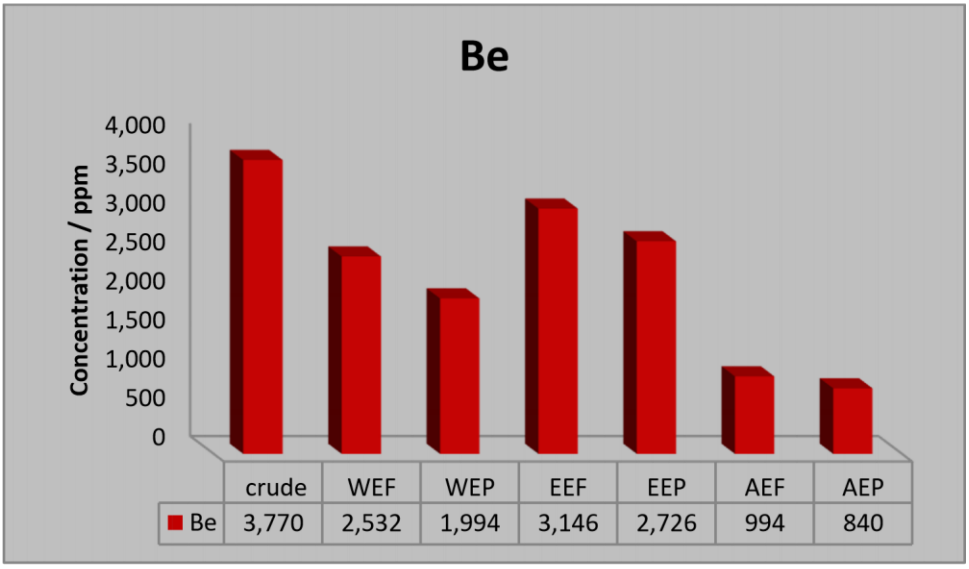
Major minerals of different extracts of *Capparis Spinosa*

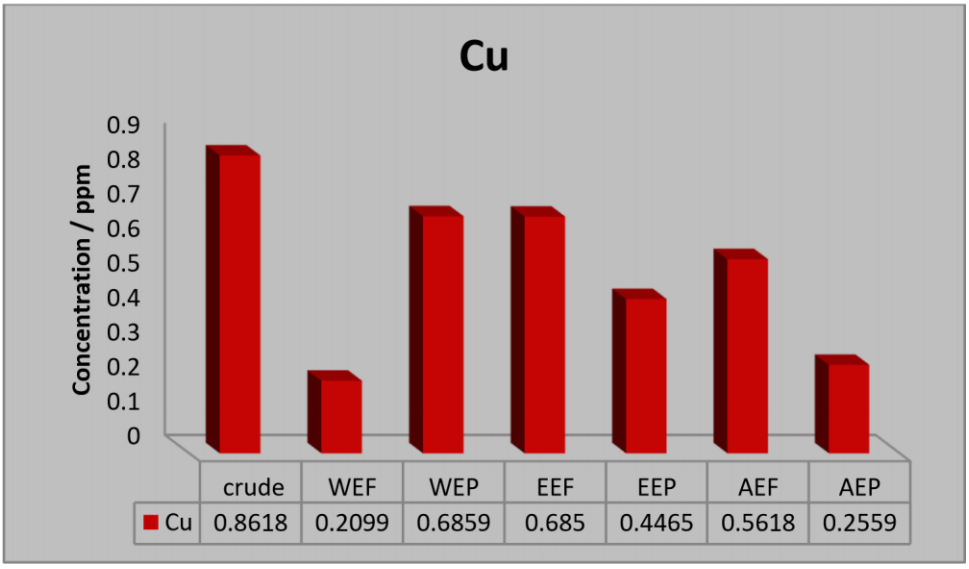


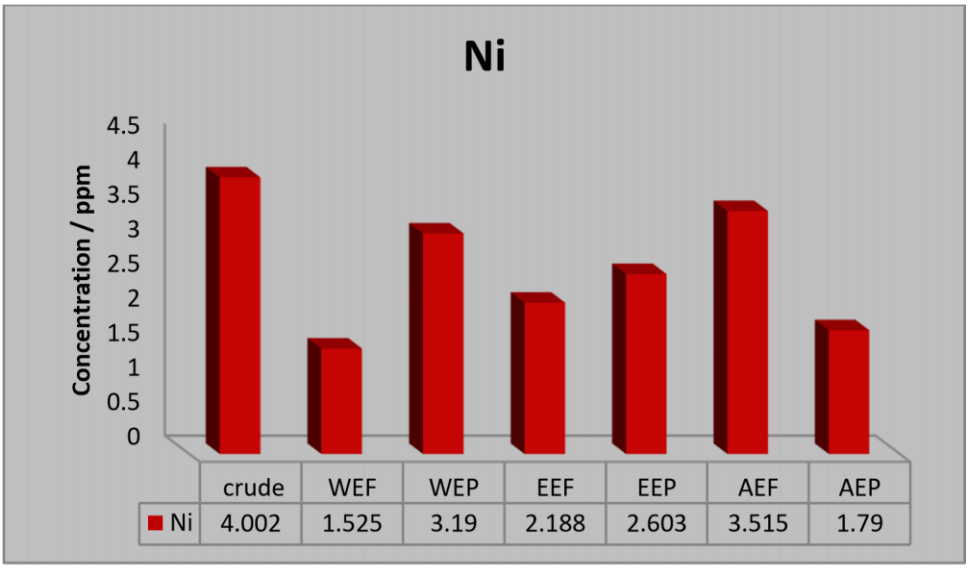


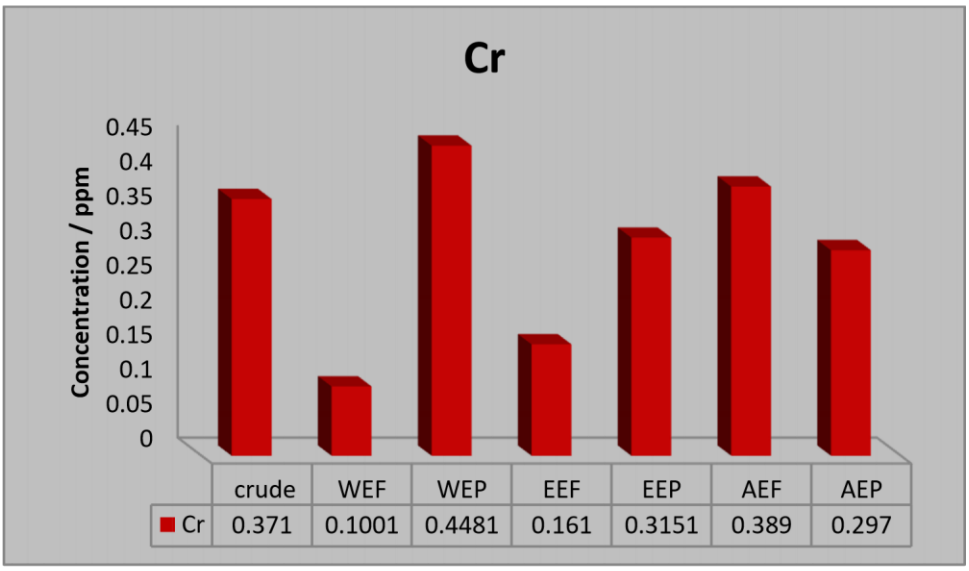


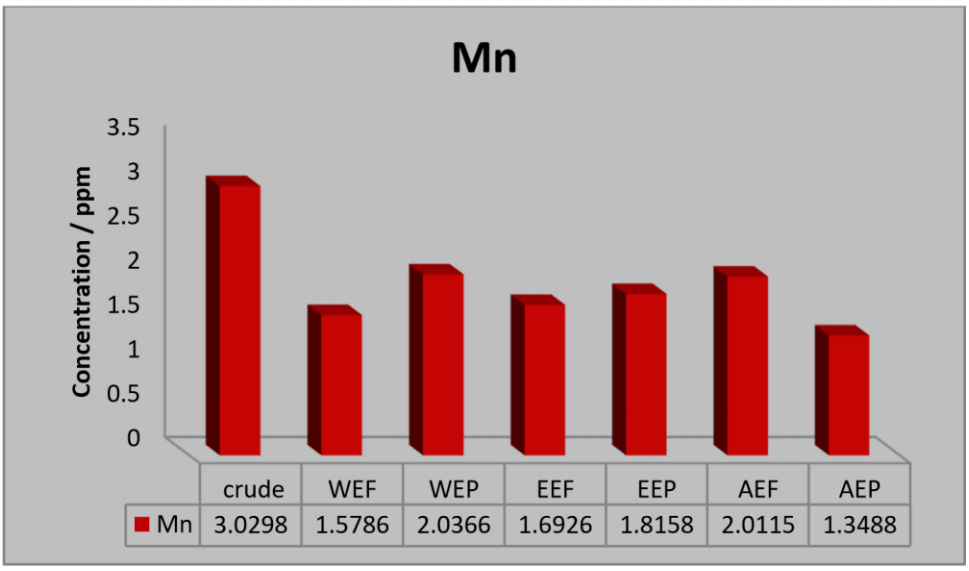

Na
Concentration / ppm
600
500
400
300
200
100
0
crude WEF WEP EEF EEP AEF AEP
Na 580 180 210 150 260 344 312

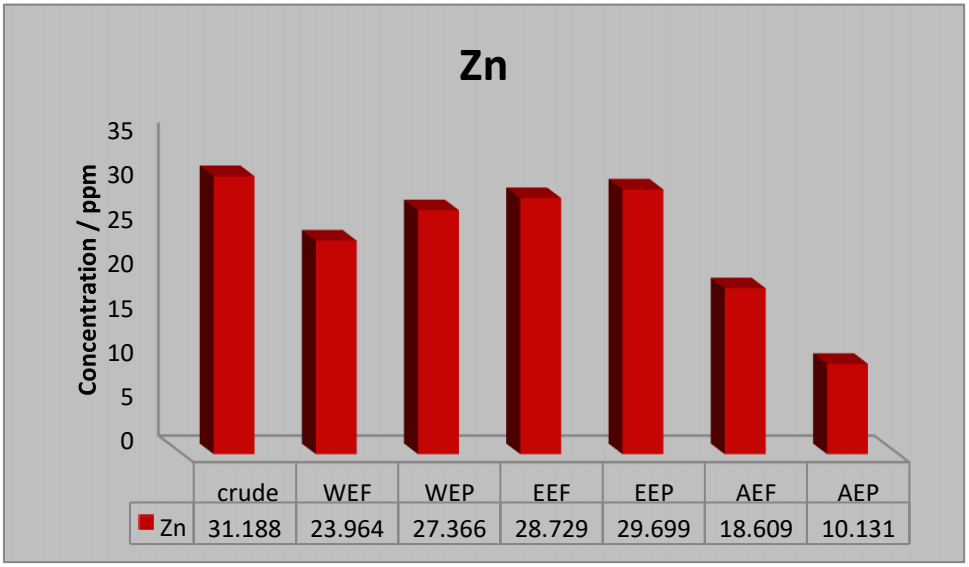

Be
Concentration / ppm
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
crude WEF WEP EEF EEP AEF AEP
Be 3,770 2,532 1,994 3,146 2,726 994 840


Cu
Concentration / ppm
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
crude WEF WEP EEF EEP AEF AEP
Cu 0.8618 0.2099 0.6859 0.685 0.4465 0.5618 0.2559


Ni
Concentration / ppm
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
crude WEF WEP EEF EEP AEF AEP
Ni 4.002 1.525 3.19 2.188 2.603 3.515 1.79


Cr
Concentration / ppm
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
crude WEF WEP EEF EEP AEF AEP
Cr 0.371 0.1001 0.4481 0.161 0.3151 0.389 0.297


Mn
Concentration / ppm
3.5
3
2.5
2
1.5
1
0.5
0
crude WEF WEP EEF EEP AEF AEP
Mn 3.0298 1.5786 2.0366 1.6926 1.8158 2.0115 1.3488



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