International Journal of Engineering Trends and Technology
ISSN: 2231–5381 / https://doi.org/10.14445/22315381/IJETT-V73I8P124

Volume 73 Issue 8, 273-291, August 2025

Review Article

Detection of Heavy Metals and Micronutrients from Allium Cepa and Cichorium Intybus

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Received: 22 January 2025 Revised: 13 June 2025 Accepted: 15 August 2025 Published: 30 August 2025

Abstract - *Several herbs and plants bear fruit like seeds, which can serve as aromatic substances that can be mixed with food, making it delicious or adding distinctive flavors. They have antioxidants and are anti-cancer, anti-fungal, anti-bacterial, and phytochemical compounds. Medicinal plants are being increasingly characterized as a promising therapeutic hotspot for the treatment of various diseases. Heavy metals and micronutrients are essential trace elements of the plant, animal and human species. There is also a unique plant requirement for some of the smaller micronutrients such as iron, copper, zinc, nickel, chloride, boron, manganese and molybdenum. Micronutrients and heavy metals are indispensable for plant survival. The objective of this review is to investigate the existence and effect of micronutrients and heavy metals in two specific selected restorative plants namely Allium cepa and Cichorium intybus one of the most established remedies with multimodal activities have been considered which are used to treat various diseases such as anti-cancer, anti-starvation, anti-microbial and cancer prevention agents, antihepatotoxic, antiseptics allergy, cure for constipation, diabetes and used as antioxidants in five of examples some plant derived dietary agents. Plants were collected from several locations for sample preparation. Sample analysis was carried out using the digestion procedure, the nitric acid procedure, and repeated nitric acid procedures. According to the results, the concentration of heavy metals present in Allium cepa and Cichorium intybus followed the sequence of iron>Manganese>Zinc>Copper>Nickel> Lead>Cadmium.*

Keywords - *Heavy metal, Micronutrient, Allium cepa, Cichorium intybus, Water pollution, Water purification, Healthy lifestyle.*

1. Introduction

Because they play a role in advancing the development of both animals and plants, micronutrients are essential for the proper functioning of the human body [1]. To provide for their basic physiological needs, animals must have essential elements and some heavy metals. All of this is part of nature. Plants are necessary for human beings and animals, who derive essential micronutrients from them [2]. When there is too much or too little of certain heavy metals or micronutrients, it can have detrimental effects on human health. From ancient times, supportive flavors and functionally accommodating plants have played a significant role in the management of diseases in developing and industrialized countries. It is used for the treatment of contamination in modern-day pharmacology. Then again, plants are the best source of food, green tea, seasoning, and taste sauces [3], and are utilized for a few significant purposes in businesses. The taste for having great importance in the higher-order time to be used for newer pharmacological agents for their enormous safety and efficacy with intense curative effects. The medicinal fixes are abundantly unique pieces of plants, which contain alkaloids, flavonoids, tannins, amino acids, saponins, glycosides, steroids, quinones, phenols, and terpenoids [4].

Even though these plants are medically important, they might be exposed to toxicants of the environment, such as air, water [5] and soil during their growth either naturally or due to storage. Those pollutants, mainly formed by heavy metals, were possible to find. These poisons are carried through the food chain to humans and have been shown to have many harmful effects [6]. Cadmium, lead, arsenic and mercury are the most toxic heavy metals. Heavy metals could be harmful because they are poisonous and can harm various organs and systems in the body. There is a spectrum of health issues that can be triggered by exposure to heavy metals, from mild to life-threatening. They can disrupt normal cellular functions and harm organs and tissues. Heavy metals are toxic to many organs, such as the kidneys, brain, liver, skin, and heart. For instance, mercury may damage the brain and nervous system, and lead can harm the kidneys and cause anemia. The rules that apply to define the possible percentages of these heavy metals depend on the country one is referring to. According to the World Health Organization (WHO), the acceptable levels of heavy metals in food products are Cd, Pb, As, and Hg in medicinal raw materials as 0.3, 10, 5, and 0.2 mg/kg, respectively. Allium cepa Linn is a habitual culinary and therapeutic spice, commonly known as onion, and belongs to the family Liliaceae. Onion is a basic ingredient in many African sauces and is also generally produced locally, Egypt being the largest producer on the continent [7]. Allium cepa L is used as food and flavor in all countries because it contains sulfur amino acids, vitamins and minerals. Also, several secondary compounds were found in them, such as flavonoids, phytosterols, and saponins [8]. It has various therapeutic effects such as anti-bacterial, anti-diabetic, and lipid-lowering agents. It is a biennial plant, grown on an annual basis. Height is 15 to 45 cm. Leaves vary from yellow to green, succulent, hollow, cylindrical and flat on one side [9]. The most well-known heavy metals in the onion Zn (81.69−304.90 (mg/kg), Cu 30.45−36.11 (mg/kg), Ni (21.97−49.02 (mg/kg), Cr (21.46−25.27 (mg/kg), Pb (28.11−29.70 (mg/kg), 1.15−1.34 (Cd mg/kg). The Cd (Cd limit 0.7 mg/kg) values were also above the Cd limit in all localities. High soil concentrations of heavy metal (Pb) are reflected in the higher concentration of Pb in onion [10].

Cichorium intybus Linn is a perennial herb used medicinally and for culinary preparations. It has bright blue, white, or pink flowers, a fleshy taproot , and many medicinal applications. Cichorium intybus is around 80±90 cm in height. The root is thick and flesh-like, up to 75 cm in length. The root of chicory is rich in volatile oils, which destroy the worm. Chicory has been mentioned in the traditional systems of medicine to treat jaundice, spleen enlargement, and disorders of the stomach and the liver. It also has inulin, a dietary fiber that can be helpful for diabetes and constipation treatment. It is called dandelion and is used as a coffee substitute and for the treatment of various diseases [11]. Its roots, containing 40% insulin [12] (Cichorium intybus), have also been applied in a broad medical area. It is also prepared for gallstones, gastroenteritis, nasal complaints, and wounds and cuts [13]. Furthermore, it also suppresses the production of tumor necrosis factor alpha-induced cyclooxygenase, so it is a potent anti-inflammatory [14]. Being rich in surficial metabolites, like phenols, it also exhibits antioxidant activity.

It provides good hepatoprotective action, caused by alkaloids, nitrogenous bases, carbohydrates, glycosides, tannins, flavonoids, saponins, unsaturated sterols, and triterpenes in plants. It has been reported that it possesses anthelmintic properties against sheep's gastrointestinal nematode parasites in experimentally infected cattle. The extract of roasted chicory root exerts beneficial effects such as antihyperglycemic and anti-dyslipidemic effects and promotion of defecation by the inulin-type fructans present in the plant. In this study, the hydrolytic compounds from Allium cepa and Cichorium intybus were characterized. Hence, it is necessary to further evaluate the concentration of heavy metals in the plants and herbs.

2. Methodology

The spine of this investigation is an exploratory clinical pilot. The article further reviews the identification of heavy metals and micronutrients in two medicinal plants, Allium cepa and Cichorium intybus. This was a polyherbal detailing.

For this, the restorative plants were collected, and after pulverization, an ethanolic extract was prepared to authenticate and identify in the laboratory. Ethanolic extracts of plant material were used to prepare the sample. Heavy metals and macronutrients were discovered in late instances of readiness plant material.

2.1. Collection of Plant Material

Plants extracted and concentrated with heavy metals and micronutrient determination were collected near the store and natural clinic in Sargodha, Pakistan.

2.2. Selection of Plants for Determination of Heavy Metals and Micronutrients

The plants are used widely throughout the country as traditional medicines. Because of the proximate application, these plants have been selected (Table 1) to scavenge their heavy metals.

Table 1. Chosen restorative plants for the determination of heavy metals and micronutrients

Botanical Name	Local Name	Family	Parts Used
Allium cepa Linn	Pīyāz	Amaryllidaceae	Whole
Cichorium intybus Linn	Chīkorī	Asteraceae	Roots

2.3. Grinding

The selected plants were squashed into fine powder in an electric processor.

2.4. Preparation of Ethanolic Extracts

2.4.1. Soaking In Ethanol

Plant powder samples were extracted with ethanol in jars that were covered with aluminum foil to avoid contamination. 200 g of the powdered sample was taken, followed by soaking in ethanol. The mixture was soaked for seven days, after which it was mixed up daily so that the ethanolic substance of the plant could overflow.

2.4.2. Filtration

For filtration of the soaked plant material, a muslin cloth using Whatman filter paper No.3 was used, followed by filtration. This caused the separate ethanolic concentrations of the selected plants.

2.4.3. Evaporation of Ethanolic Crude Extract

The filtered solution was evaporated to dryness on a rotatory evaporator (Laborota 4000 professional Heidolph).

The entire dissolution was exhausted, and the crude ethanolic concentrate was retained.

2.4.4. Collection of Crude Ethanolic Extracts

Subsequently, the crude ethanolic extract was collected in an autoclaved bird of prey tube and stored in the laboratory at 20 °C.

2.4.5. Preparation of Different Doses

For estimation of the inhibitory centralizations of the selected plants, three measurements were prepared with the concentrations of 5ppm/ml, 25ppm/ml, 50ppm/ml and standard 5ppm, 25ppm, and 50ppm.

2.4.6. Preparation of Polyherbal Formulation (PHF)

The methanolic concentrates of each plant have been taken independently in equivalent amounts and blended to set up the polyherbal detailing.

2.4.7. Instruments/Apparatus Used

The instruments/apparatus used in this research work are listed in Table 2.

Table 2. List of instruments/apparatus used

Instrument	Brand Name and Country
Absorption Atomic spectrophotometry novAA 400P	Analytikjena /Germany
Rotatory evaporator	Laborota 4000 efficient (Heidolph) / Germany
Conical flask	Pyrex / England.
Electronic balance	USA
Pyrex beaker	
Measuring slander	Germany
Incubator	BINDER / USA
Oven	USA
Thermometer	China
Test tubes	
Filter paper	Whatman Ltd. / England
Neubar Chamber	

2.4.8. Phytochemical Screening

Phytochemical constituents (heavy metals and micronutrients) explored through advanced techniques:

2.4.9. Glassware

All the quasi apparatus was washed with a chemical course of action, washed with refined water, and put away for 1 day in a 10% HNO_3 bath. The precious stone was flushed twice in double-refined water after being taken out of the destructive shower and then air-dried.

The dry openings of the dish sets were sealed with parafilm so as not to become contaminated during collecting.

2.4.10. Sample Preparation

Plant material was analyzed for the selection of heavy metals and micronutrients by atomic absorption spectrophotometry. Two-gram checks were performed, and dried at 65 °C for 24 hours, ejected from the drying grill and then weighed with a precision of 0.0001g.

2.4.11. Steps Involved in Sample Preparation

- The preparation of the flask
- The preparation of the sample
- The digestion of the sample
- The dilution of the sample
- The filtration of the sample

2.4.12. Flask Preparation

First, after digestion, the flagon was cleaned properly to remove the pollution, and the glass sample was then soaked in 10% HNO_3 for 12 hours. The carafe was subsequently rinsed with deionized water and then dried in a stove for 10 minutes.

2.4.13. Sample Preparation

For experimental design, two clean jars were selected and labeled as jar 1 and flagon 2. Later that day, 2 g of test was weighed, and the model was exchanged in carafe 1, including 20ml of nitric acid and 10ml of 70% perchloric acid in both shrapnel.

2.4.14. Sample Digestion

The jar has access to an exhaust hood, wherein the sample will be treated at room temperature for 24 hours. After 12 hours, the brown color appeared in a test flagon due to sample absorption.

Then they both soaked the carafe, and it was placed on the warming shelf of the digestion warmed at 120 degrees. Brownish-red filth formed by HNO_3 in the two flasks.

2.4.15. Sample Dilution

5-10ml of related juice was added using deionized water in a carafe after 30 minutes to weaken the sample for the test.

2.4.16. Sample Filtration

Rinse the fennel in deionized water for test filtration. The filtration was done with Whatman Channel paper. Whatman channel paper was collapsed and placed on fennel; a small amount of the test was poured on channel paper and recharged with 30 ml of deionized water to dilute the concentration of the separated solution.

2.4.17. Digestion Procedure

There were 2 g of stove-dried plant material tests, and two destructive spaces were processed using the entire sample. Then, 10 to 20 mL of double-distilled water and 10 mL of concentrated, very pure nitric acid solutions were added to the beaker and were placed on the hot plate.

2.4.18. Nitric Acid Procedure

The spattered example together with 20 ml of concentrated ultrapure nitric acid solution was placed into a 125 ml Erlenmeyer flask, and then the flask mouth was covered with a small watch glass, whereat the reaction combination was refluxed at 80 °C for 3.5 hours. To finish the osmosis process, any remaining unoxidized destructible was then left to set off by removing the watch glass for an hour. Shaking was maintained in a pre-warmed shaker for temperature and the comfort of mixing.

2.4.19. Repeated Nitric Acid Procedure

The repeated nitric corrosive strategy functioned as a rule, in the way that the handling was completed, as depicted by Middleton and Stuckey, aside from the high temperature at which the treatment was completed. In this method, a 1 L vessel of the model, a 1 L vessel filled with 10 mL of 2-fold-distilled water and 10 mL concentrated very pure nitric acid. The consistency was spread onto a hotplate maintained at 125 °C to dryness, and the latter was cooled. 10 mL concentrated nitric acid solutions were added to the development, re-spread to dryness, and eluted with the same solvent. This process was repeated until only white growth material was left. The growth material was then dissolved in 10 mL of concentrated ultra-pure nitric acid.

2.4.20. Sample Preparation for Atomic Absorption Analysis

Following every continuation, one drop of 6 N hydrochloric acid was added per 20 mL of analyte plan before filtration to combine the familial model minor portions from paper adsorption on stream. Destructive, flushed Whatman, no. 2 paper was employed. The models and destructive spaces were diluted to 100 mL with double-distilled water. Weak models were nourished till analysis in disposable washed polyethene bottles.

2.4.21. Analysis of Micronutrients and Metal Ions

Sulphuric acid was used on 1g of dissolvable leaves after removing them. The volume of the solution was adjusted to 100m1 by means of a volumetric flask after filtration. The metal particles and micronutrients were analysed using an Atomic Absorption Spectrometer (AAS).

2.4.22. Trace-Element Determinations

The Cu, Fe, Cd, Mn, Ni, Pb, and Zn concentrations in the not really set in stone were analyzed using a novAA400P atomic absorption spectrophotometer fitted with a novAA400P.

2.5. Determination of zinc

2.5.1. Preparation of Zinc Standard Calibration Solution

Dissolution of 0.439 g of ZnSO4 was disintegrated in 10 mL of concentrated HCl and made up to 100 ml using a graduated flask with distilled water. This is 1000 parts per million zinc. 2/10, 4/10, 6/10 and 8/10 zinc parts per million were prepared by pipetting three, four, and six ml of zinc from a ten ml solution and diluting it to one hundred ml. AAS 201/203 is improved with an empty zinc cathode light and was checked with an 8/10 ppm answer for producing at least 6/10 nanometer absorbance.

2.6. Determination of Iron

2.6.1. Preparation of Iron Standard Calibration Solution

0.7021g of ferrous ammonium sulfate was precipitated in 10 mL of a concentration of HCl, and with the volumetric carafe diluted upto 100ml with distilled water (called 1000 ppm of iron solution). Then, up to 100ml to compensate, the above-said procedure was followed by volumetric flasks, 10ml of the above observed action sieved and diluted with distilled water (called 100 ppm Fe solution). Two ml of 100ppm iron solution was taken, including two ml of concentrated hydrochloric acid and diluted to 100ml to give two portions of the million iron course of action. Four, six, eight and ten parts per million of iron 100 parts per million were spiked with two ml of concentrated hydrochloric acid and made up to 100 ml with refined water. The iron light speed of the AAS 201/203 and iron response was calibrated with a 10ppm iron response to obtain a minimum of 5/10 nanometer absorbance.

2.7. Determination of Copper

2.7.1. Preparation of Copper Standard Calibration Solutions

Weigh out 0.3927 g of $CuSO_4$ and dissolve it in 5 mL of concentrated hydrochloric acid. It is diluted to volume (100 ml) with distilled water in a volumetric flask. This is a 1000 parts per million copper solution. Ten ml from this solution is diluted to 100 ml with distilled water to obtain 1ppm of copper solution. Furthermore, two, three, four, and five ml of the 100 parts per million solutions are diluted to 100 ml in volumetric cups to give two parts per million, three parts per million, four parts per million, and five parts per million copper solutions. The AAS 201/203 was run with empty cathode copper light and calibrated with a five parts per million copper solution to produce 6/10 nanometer absorbance.

2.8. Determination of Chromium

2.8.1.Preparation of Chromium Standard Calibration Solutions

2.829 g of potassium dichromate ($K_2Cr_2O_7$) was dissolved in distilled water and treated with 2ml of concentrated nitric corrosive and lastly diluted to make up a volume of 1000 ml in a volumetric flask. This essentially is 1000 parts per million of chromium. This 2/10 parts per million chromium solution was prepared by dispensing 2 ml of 10 ppm solution in a volumetric pairing and diluting to 100 ml. 4/10 ppm, 6/10 ppm and 8/10 ppm chromium solutions were prepared by pipetting four, six and eight ml of 10 ppm chromium solutions and diluting to 100 ml. AAS 201/203 enriched with the chromium hollow cathode light and 5/10 ppm solution, was controlled to generate a minimum of 6/10 nm. Absorbance. Absorbance of 0.2 parts per million, 0.4 parts per million, 0.6 parts per million, and 0.8 parts per million arrangements were computed, and then the absorbance of the sample solution was determined.

2.9. Determination of Lead

2.9.1. Arrangement of Lead Standard Calibration Solution

1.5982 g of lead nitrate is dissolved in 10 ml of concentrated nitric corrosive and diluted to as long as 100 ml with deionized water in a volumetric mug.

A thousand parts per million of lead arrangements. (2/10) parts per million, (4/10) parts per million, (6/10) parts per million, and (8/10) parts per million lead solutions are prepared by measuring four ml, six ml and eight ml of lead ten parts per million solution and diluting to 100 mL. AAS201/203 with Lead light-dark correction is converted and corrected using 8/10 ppm absorbance, which is manufactured to give a minimum of 0.6 nm of absorption.

2.10. Determination of Nickel

2.10.1. Arrangement of Nickel Standard Calibration Solution

0.44576 g of Nickle sulfate is dissolved in 10 ml of concentrated hydrochloric acid and diluted to 100 mL in a volumetric flask.

That is 1000 parts per million worth of nickels. 0/10 parts per million, 2/10 parts per million, 4/10 parts per million, 6/10 parts per million and 8/10 parts per million, nickel plans are prepared by measuring out of the nickel ten sections for each million course of action, which can be taken four ml, six ml and eight ml and up to 100 ml. The AAS 201/203 averages nickel void cathode light and checks with 8/10 parts per million, resulting in giving essentially 6/10 nanometers of absorbance.

3. Results

Unacceptably high concentrations of heavy metals exceeding the permissible limit in remedial plants raise concerns of public safety worldwide. High accumulation of heavy metals causes acute and chronic toxicity in living organisms, and the toxicity mainly occurs in a dependent manner. The major threat of heavy metal toxification is its cancerous effects, which are caused by the generation of nitrogen and reactive oxygen species. In order to address this issue of silver and handle security and to raise security, it is necessary to decide the proximity and grouping of heavy metals in restorative plants utilized for curing a wide range of infections.

The plant materials were collected from Sargodha College, and extracts were obtained in the college's advanced lab. In this way, plant material was dried in the shade through a powder processor and afterwards isolated with methanol. Filtered through channel paper, evaporated on a rotating evaporator and freeze-dried to remove all solvent effects.

The methanolic and ethanolic concentration of plants was prepared and screened for in vitro natural activities against various diseases. Assimilation method, nitric corrosive technique, rehashed nitric corrosive technique and investigation of its key segments exhibited in the plants under the current assessment were performed on Analytica Nova 40P, Atomic Absorption Spectrophotometer.

Plants used as medicine in community and individual health care are significant. Various plants are employed for medicinal purposes due to the existence of certain chemical compounds, such as the bioactive metabolites, flavonoids, alkaloids, saponins, tannins, and steroids, having specific biological effects on the body system. Two species of plants are being employed as medicaments because of the presence of heavy metals and micro-elements in them, which have sure biological effects on the human body.

Qualitative screening for phytoconstituents of the methanolic extract of chosen medicinal plants is provided in Table 3. Results indicate the level of heavy metals and micronutrients. The table shows the normal upsides of heavy metals and trace elements, when contrasted with these upsides for each of the three samples prepared for the determination of heavy metals and micronutrients (Zn, Fe, Cu, Cd, Mn, Pb, and Ni) in the two plants Allium cepa and Cichorium intybus.

Table 3. Concentration of heavy metals in Allium cepa and Cichorium intybus

Sr. No.	Results	Sample Type	Allium Cepa	Cichorium Intybus
1	Zn.213	sample 1	212.816 mg/kg	198.943mg/kg
		sample 2	205.739 mg/kg	179.837 mg/kg
		sample 3	199.629 mg/kg	202.803 mg/kg
2	Fe.248	sample 1	987.376 mg/kg	892.138 mg/kg
		sample 2	958.682 mg/kg	887.130 mg/kg
		sample 3	956.192 mg/kg	884.28 mg/kg
3	cu.34	sample 1	31.541 mg/kg	45.124 mg/kg
		sample 2	30.817 mg/kg	44.234 mg/kg
		sample 3	32.717 mg/kg	44.694 mg/kg
4	Cd.228	sample 1	0.401 mg/kg	0.132 mg/kg
		sample 2	0.400 mg/kg	0.117 mg/kg

		sample 3	1.2 mg/kg	0.243 mg/kg
5	Mn.279	sample	514.131 mg/kg	701.001 mg/kg
		sample 2	503.107 mg/kg	706.036 mg/kg
		sample 3	511.3357 mg/kg	699.631 mg/kg
6	Pb.217	sample 1	0.989 mg/kg	0.973 mg/kg
		sample 2	0.925 mg/kg	0.896 mg/kg
		sample 3	1.555 mg/kg	1.206 mg/kg
7	Ni.232	sample 1	5.326 mg/kg	1.890 mg/kg
		sample 2	5.157 mg/kg	1.792 mg/kg
		sample 3	5.957 mg/kg	2.022 mg/kg

The value of Zn in Allium cepa has been presented in Figure 1. In the first example, the value for Zn was 212.816 mg/kg, while in the second example, the value of Zn was 205.739 mg//kg, and in definition 3, the value of Zn was 199.629 mg/kg. In all situations, the zinc benefits were taken to the extent of the application.

The value of Zn in Colchicum autumnale was presented in Figure 2. In the main trial, iron amounted to 198.943 mg/kg; in the second case, iron was 179.837 mg/kg; in example 3, the iron content was 202.803 mg/kg. In all cases , the advantages of zinc were as far as possible. The value of Fe in Apium graveolens is given in Figure 3. In the first example, the value of Fe was 987.376 mg/kg, in the second example, the value of Fe was 958.682 mg/kg, and in example 3, the value of Fe was 956.192 mg/kg. The advantages of iron were possible in all cases.

Figure 4 shows the value of Fe in Colchicum autumnale. In the main test, the value of Fe was 892.138 mg/kg, in the second sample, the value was 887.130 mg/kg, and in sample 3, the value of Fe was 884.28 mg/kg. In all instances, the benefits of iron were maximised. The value of Cu in Apium graveolens is presented in Figure 5. In the Lead Test, the value of Cu was 31.541 mg/kg; in the Second Example, the value of Cu was 32.717 mg/kg; in Example 3, the value of Cu was 32.717 mg/kg. In each instance, the positives of Cu were as high as possible.

The value of Cu in Colchicum autumnale is represented in Figure 6. In the first example, the Cu value was 45.124 mg/kg, in the second, the Cu value was 44.234 mg/kg, and in the example 3, the Cu value was 44.694 mg/kg. In all cases, the Cu upsides were in to the extent possible.

Figure 7 illustrates the Cd content of Apium graveolens. The value of Cd was 0.401 mg/kg in sample 1, 0.400 mg/kg in sample 2 and 1.2 mg/kg in sample 3. The Cd concentrations were also not within the safe limit in all the samples. The Cd content of Colchicum autumnale is presented in Figure 8. In the first sample, Cd amounted to 0.132 mg/kg, in the second sample to 0.117 mg/kg and 939 in sample 3 (0.243 mg/kg). The Cd values were risky and did not remain safe in any of the samples. Figure 9 shows the perspective of Mn in Allium cepa. The Mn contents of sample 1 (514.131 mg/kg), sample 2 (503.107 mg/kg) and sample 3 (511.3357 mg/kg). The content of Mn in all samples was below permissible levels.

Figure 10 shows the content of Mn in Cichorium intybus. In Sample 1, the Mn content was 701.001 mg/kg., In Sample 2, the value of Mn was established as 706.036 mg/kg and in Sample 3, the value of Mn was 699.631 mg/kg. In the three samples, the Mn levels were inside the safe limit. The Pb level in Allium cepa is shown in Figure 11. Pb concentration for the 1st sample was 0.989 mg/kg, for the 2nd sample 0.925 mg/kg and for sample 3 1.555 mg/kg. Results: all samples were within the safe range of Pb levels.

The Pb data in Cichorium intybus are depicted in Figure 12. The content of Pb was 0.973 mg/kg in the first sample, 0.896 mg/kg in the second sample, and 1.206 mg/kg in the third sample. The values of Pb in all samples were safe. Figure 13 depicts the amount of Ni concentration in Allium cepa. The Ni contents from the first sample were 5.326 mg/kg, the second sample had 5.157, and the third sample 3 had 5.957. In all the samples, Ni values were found to be within the safe limit. The content of Ni in Cichorium intybus is illustrated in Figure 14. In the first sample, Ni had a value of 1.890 mg/kg, in the second sample, Ni had a value of 1.792 mg/kg, and in sample 3, Ni had a value of 2.022 mg/kg. Ni was found to be within a safe range in all the samples.

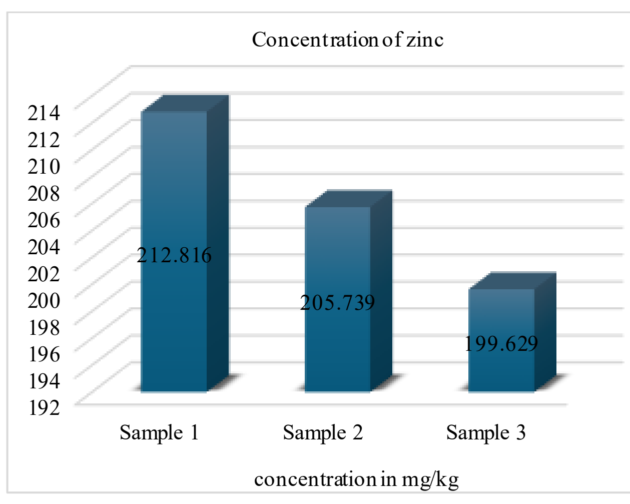

Fig. 1 Concentration of Zn in Allium cepa

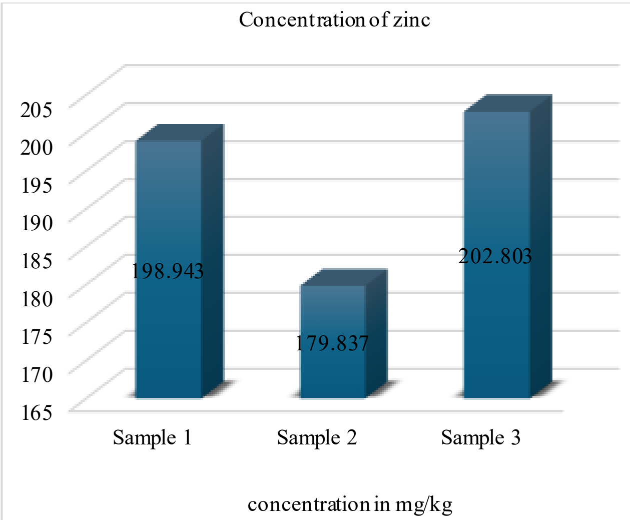

Fig. 2 Concentration of Zn in Cichorium intybus

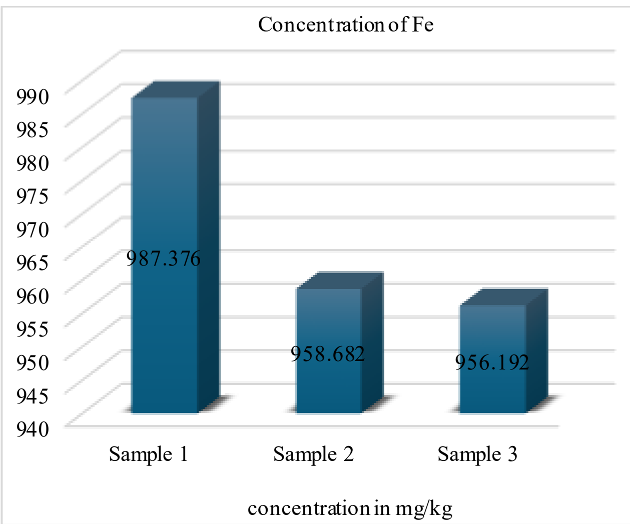

Fig. 3 Concentration of Fe in Allium cepa

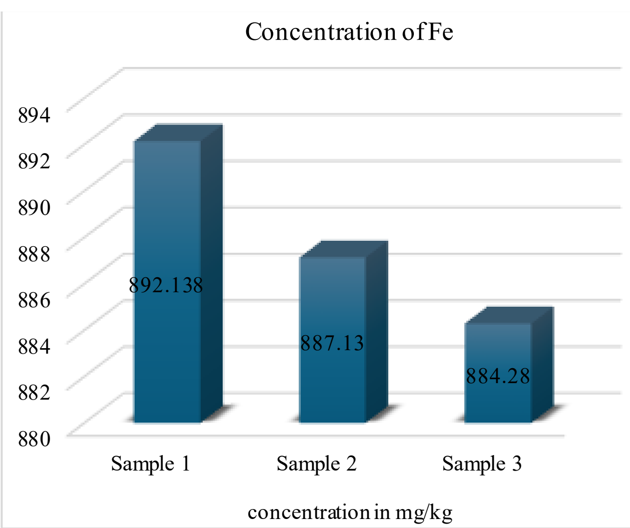

Fig. 4 Concentration of Fe in Cichorium intybus

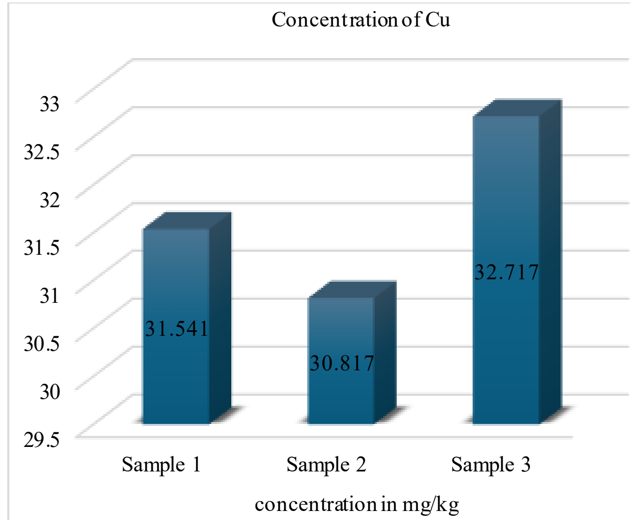

Fig. 5 Concentration of Cu in Allium cepa

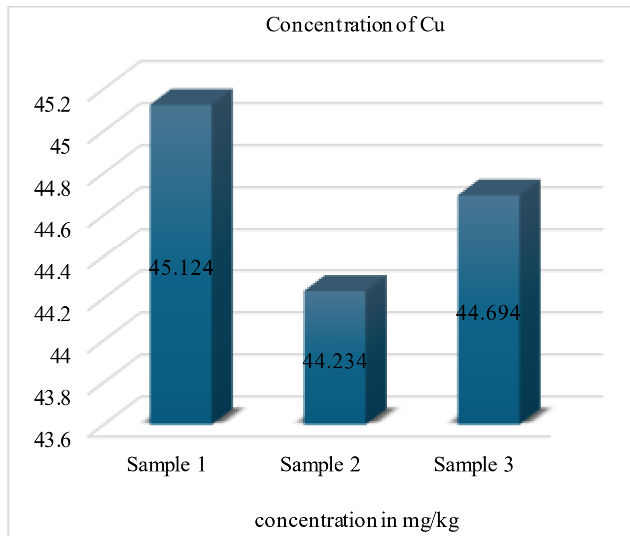

Fig. 6 Concentration of Cu in Cichorium intybus

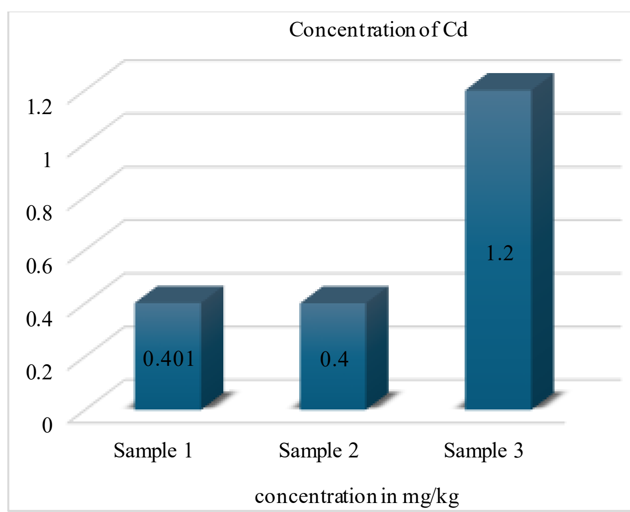

Fig. 7 Concentration of Cd in Allium cepa

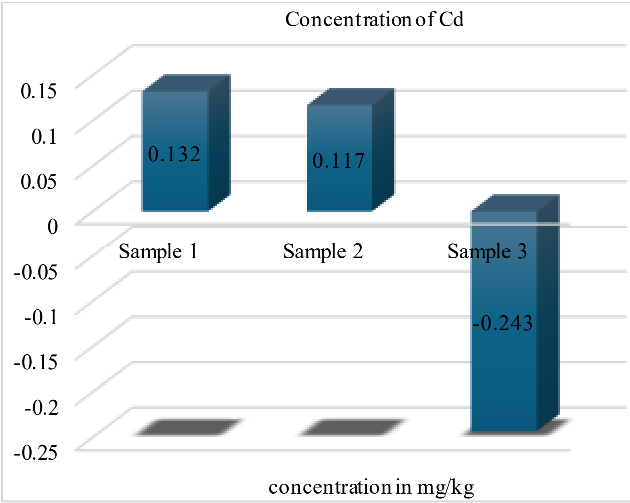

Fig. 8 Concentration of Cd in Cichorium intybus

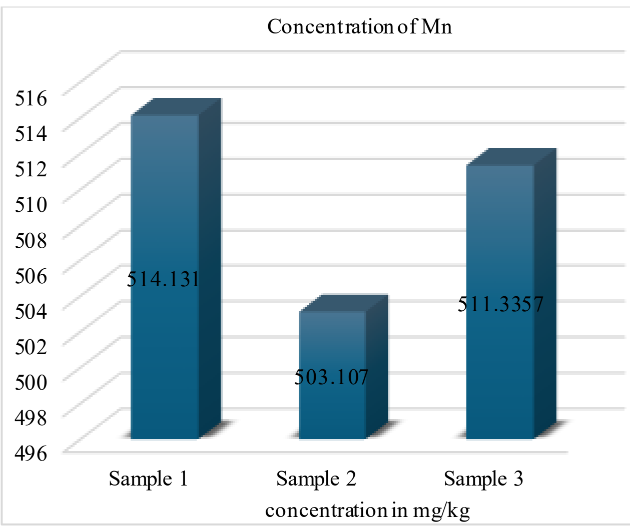

Fig. 9 Concentration of Mn in Allium cepa

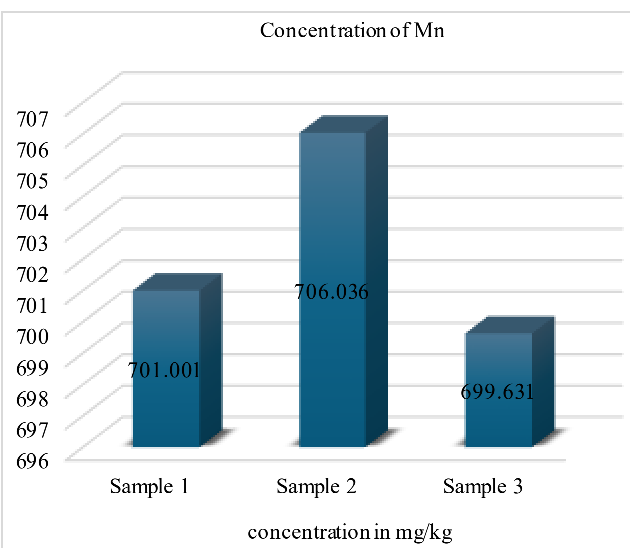

Fig. 10 Concentration of Mn in Cichorium intybus

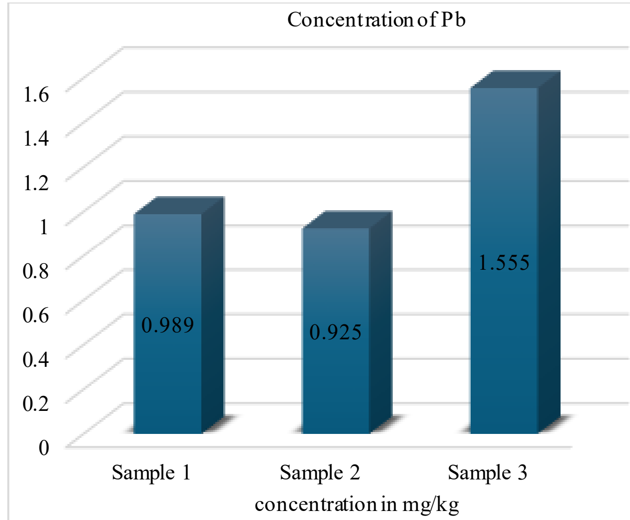

Fig. 11 Concentration of Pb in Allium cepa

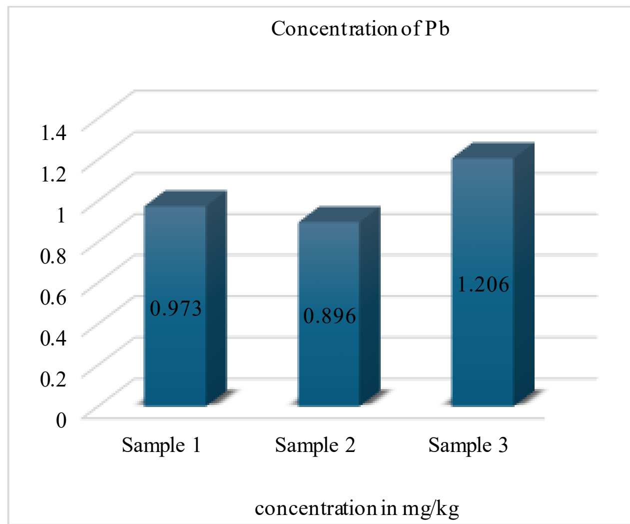

Fig. 12 Concentration of Pb in Cichorium intybus

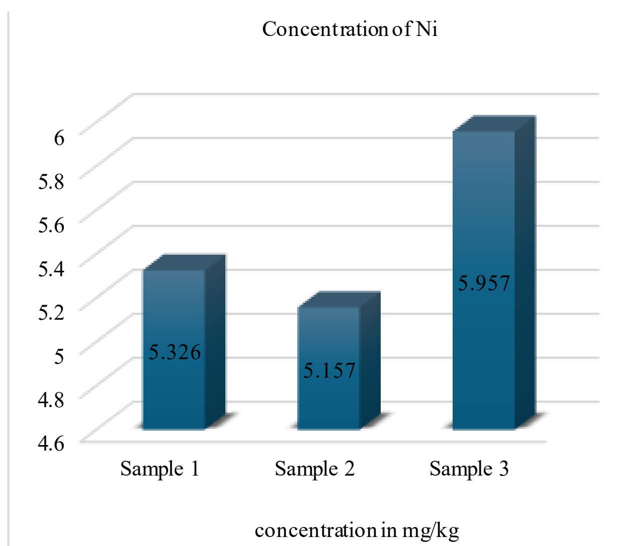

Fig. 13 Concentration of Ni in Allium cepa

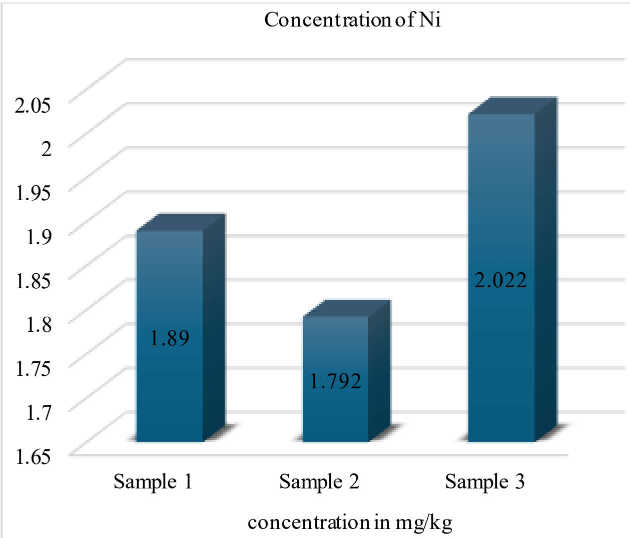

Fig. 14 Concentration of Ni in Cichorium intybus

4. Discussions

Describing heavy metals as metallic elements, they generally indicated higher atomic weight values [15] and are denser than water (at least 5 times). Many of these metals are used in industrial, domestic, agricultural, medical or electronics applications. Thus, their presence can be found virtually anywhere [16]. Their toxicity is determined by the dose, the chemical form they are in, the age and sex of those exposed, any genetic predisposition, and nutritional status for exposure [17].

Heavy elements are cadmium, copper, lead, zinc, platinum, mercury, arsenic, silver, iron and chromium. All these metals cause poisoning if they enter and accumulate in the body in forms that are hard to resolve [18]. Heavy metals are one of the most common sources of pollutants [19], due mainly to the increasing demand for clean water sources in the world, particularly in developing regions as in North and South Africa, Turkey, Yemen, Zimbabwe, Nigeria, Tanzania and Egypt. The awfulness of these heavy metals is due to their non-degradable nature [20], long biological half-life, and toxicological properties regardless of their existence at trace levels [21].

Human well-being, safety, and quality expressions are vital issues of universal requirements and norms [22]. Nevertheless, there are tremendous differences among some countries ' requirements for safeguarding safety and quality in plant products [23]. Several guidelines have been established globally for medicinal plants and related generics, such as the US Pharmacopeia, Italian Pharmacopeia and European Pharmacopeia. There are also legal frameworks at national and provincial levels intended to manage plant-based products [24]. Before 1988, only fourteen (World Health Organization) Member States had laws on traditional medicine products, but by 2003, the number of Member States had increased to 53. Of those without laws/rules, 49% reported that while backstage regulations were being prepared, they would not be notified [25]. Several countries, including Canada, China, Malaysia, Singapore and Thailand, have introduced their own national standards to ensure reasonable levels of heavy metals in medical plants [26] and plant-based products.

According to WHO data, therapeutic plants are used by 70–80% of consumers. Common disagreeable substances such as leaves, fat, colors, rhizomes and roots can be sources of unwanted toxic constituents [27], including heavy metals. The most far-fetched points of confinement for overwhelming metals in restorative plants oral statement are suggested by the WHO to incorporate the following: less than 10 mg Pb/kg and 0.3 mg Cd/kg. The accumulation of heavy metals and micronutrients in traditional medicine pharmaceutical plants was mostly reviewed [28]. Various exploration studies have been performed to determine the occurrence and identify the concentration of microelements and heavy metals in medicinal plants [29]. Both creating and created nations have announced high levels of dangerous metals in plant-based products accessible to individuals [30].

The level of heavy metals in customary Asian common standards sold in the USA was noted in one examination, and it was from China and Vietnam that over 74% of these things involved colossal levels of heavy metals 74% higher than the levels recommended for the overall population. In Brazil, those things are not regularly quality-controlled, and their quality, amount and security are suspicious. The results indicate the necessary need for coordinated control of toxic heavy metals in medicinal plants [31]. Cosmetics can be the source of heavy metals, present naturally in some ingredients or added as a preservative, color or stabilizer [32]. Some metals, such as iron, are even necessary for bodily processes. Certain heavy metals are also used as colorants in cosmetics, such as chromium in eyeshadows and iron oxides in other cosmetic products [33]. Mercury has been used as a preservative; however, its usage has been banned because of health issues. Heavy metals may also be incorporated to enhance the texture, homogeneity, and stability of cosmetic items [34].

It was displayed that arsenic, cadmium, lead, mercury, and nickel were found in different brands of skin care products, including creams, lipsticks, and lip gloss. The outcome of the study uncovered that the pernicious metals were accessible in low aggregates [35].

The perpetual utilization of supportive things contaminated with such impressive metals may at least cause moderate appearance of these metals into the human body and cause horrendous impacts on the purchasers after an adequately long timetable [36]. Wide utilization of such things ought to be avoided. The auxiliary impacts related to mercury poisoning among people who utilized a Mexican miracle cream containing mercurous chloride have been addressed in people living in Texas close to the Mexico line. A few instances of poisonings inferable from the utilization of skin creams containing mercury have been addressed previously. Hg-containing skin-easing off creams are still usually utilized in various non-present-day nations [37].

Due to their long history of use, consumers of traditional medicines are of the opinion that they are safe for human consumption. But in aspects such as collection, processing and storage, the absence of regulation and control of the drug business is no guarantee of this. Environmental pollution, misidentification and adulteration provide further causes for concern. The potential adverse effects of traditional South African medicine are poorly documented. There are only a few studies on the mutagenic properties of heavy metals that are harmful. With no regulatory controls in place, the safety and quality of medical plants vary greatly.

A recent investigational study performed by Street and co-workers [38] demonstrated that the help plants prepared in South Africa, collected from a range of unspecific locations by plant finders and sold at Johannesburg and Pretoria informal markets, showed varying metal contaminations. All the models show that Pb and Ni, as well as increased Fe and Mn content, were observed in specific plant species. Spasmodically testing plants at these minimums from the traditional remedy market is the best way to assure security for the client. This has become muddied because plants of the same species are continually being collected from all over and put together in one collection facet. That acceptance plants can be used for metal contamination is essential, as these plants are commonly used as loading materials for many common articles. Contamination of Egyptian spices and medicinal plants by heavy metals was reported. For estimating the titers of heavy metals in tested spices and medicinal plants, 303 samples, which included 20 varieties of spices and medicinal plants, collected from exporting areas in Egypt, were identified. They have different growing seasons, and they each have their own agricultural practices and multiple shipments. The total content of heavy metals in the analyzed samples ranged from 14.4 to 1046.25 microg/g for Pb, Cd, Cr, Ni, Sn, Zn, Mn, Cu and Fe on a dry weight basis [39]. No cobalt was found in any sample in the group studied. The concentrations of heavy metals in the tested samples were greater than the permissible limits of Zentrale Erfassungs und Bewertungsstelle für Umweltchemikalien. Boiling the plant with water yields more metal from the plant than bathing it in the same hot water.

Herbal use is not controlled in Nigeria and most low-resource countries, but is accessible to all. Very little is known about the safety of these herbal medicines [40]. The herbal products (ready-to-use) were purchased in the open market and digested with HNO_3. Analysis of heavy metals in the digested filtrate by atomic absorption spectrometry. Based on the findings, all the samples were found to have higher levels of heavy metals (100%). The study showed that Nigerian herbal remedies contained substantial amounts of iron, nickel, cadmium, copper, lead, selenium, and zinc, which can cause detrimental effects on health when taken as frequently recommended. These findings are concerning regarding the intention of heavy metal poisoning from herbal products in Nigeria [41]. The risks associated with the consumption of herbal drugs should be reported and described by comprehensive risk assessment studies.

In this discussion, the intermingling of key parts, including significant metals, micronutrients, and macronutrients, in two helpful plants, Allium cepa and Cichorium intybus, *is* still hanging out there. From the audit, it was noticed that these central parts were found in different obsessions in the two plants. The point of this review is to assess the presence of heavy metals and micronutrients in Allium cepa and Cichorium intybus. Heavy metals focus on various pieces of plants exhibiting their viability for the progression of these plants. Different cycles are involved in the transportation of these heavy metals and micronutrients, including phyto extraction, phyto adjustment, rhizo filtration, and so forth. These plants have an incredible restorative significance. The fixation arrangement of heavy metals in Allium cepa and Cichorium intybus is cadmium>lead> nickel>copper>zinc>manganese> iron.

Iron is an essential mineral for a wide number of functions of the body, particularly for oxygen transport, energy metabolism and the immune system as well. Iron also supports muscle oxygenation (myoglobin) and contributes to the production of some hormones. Iron also helps oxygen-rich blood get to cells so it can produce energy [42]. Iron, being a redox dynamic part, has exceptional importance for eternity. In plants, iron is related to the course of photosynthesis, compound biosynthesis, nitrogen processing, signalling through reactive oxygen species and mitochondrial respiration. More than 80% of the present iron in chloroplasts is drawn in with photosynthesis. Considering the iron ligand, there are three groups of iron-containing proteins: iron proteins, heme-containing proteins, and proteins with iron-sulfur bundles. Iron proteins tie directly with iron particles, and ferritin is the most obvious delineation of such proteins. Ferritin is found in non-green plastids, not in chloroplasts [43]. The heme proteins are generally called hemoproteins and are respiratory and photosynthetic cytochromes, except for critical parts involved in responding through reactive oxygen species and electron movement. Hemoproteins are found passed on in all subcellular spaces of plants, and heme is coordinated in both chloroplasts and mitochondria. Protein with iron-sulfur serves their ability as compounds and play a huge part as regulatory proteins and electron carriers. These proteins also play a fundamental part in the action of iron-storing moieties, controlling protein structure, electron transport, and translational rules.

Ferritin is a key protein the body manufactures because it stores and then releases iron when needed for processes like producing red blood cells. It also serves to protect against the potential dangers of excess or free iron. If ferritin levels become too high or low--which they can with age--they will cause health issues like extreme fatigue, fainting spells and even anemia. Iron is also important for strong muscles, bone marrow, and organs such as the liver. It is essential to the composition of cells that make up human bodies; iron even has some developmental impact on children's brains.

Concerning the press, the recommended utmost ranges of plant sustenance for the ingestion of people set by the World Health Organisation is 10 to 15 mg for men, 15 to 20 mg for breastfeeding women, and 8 to 13 mg for youths. It was found by the examination of both restorative plants that the centralization of Fe was low in the two species. The combination of Fe in Allium cepa was more than the centralization of Fe in Cichorium intybus. For the blend of protein, energy creation, and staying aware of the trustworthiness and plan of biofilm, zinc as a principal part plays a critical role. According to an assumption, it is communicated that more than 1200 proteins tie, transport, and contain zinc as a fundamental part. Metalloproteases and oxidase reductases are more typical occurrences of hydrolytic proteins and record factors that contain zinc. For plant advancement, zinc improves speed, and zinc-lacking plants show delayed improvement [44]. In the record, understanding and RNA-take care of most of the zinc impetuses plays a critical role. In the case of expected proteins in Arabidopsis, more than 4% contain a zinc-finger motif, which is considered significantly huge for protein-protein affiliation and as a critical record factor [45]. Zinc is an essential element needed in the body to perform numerous roles and processes. These include supporting the immune system, wound healing, and general growth and development [46]. Zinc also helps with preserving chemical processes, such as the sense of smell and taste. In the immune system, this mineral helps function properly by combating infections and microorganisms present. Zinc is responsible for the creation of some types of white blood cells, such as T-cells, that help seek and destroy infected body cells. Moreover, it is necessary for growth and development during pregnancy, infancy, childhood, and adolescence [47]. Zinc is involved in the development of DNA and RNA and protein synthesis, which are necessary for cell growth and division.

Zinc (Zn) is a micronutrient, and plants only need very small amounts of it. It is not a structural component like the cellulose or lignin that compose a plant's body [48]. Zinc is absorbed from the soil by roots and then transported to every part of the plant. It is not stored as a visible substance, but rather all matter that goes on to build and operate innumerable different molecules and processes in the plant. Reason for deficiency in zinc (and hence the requirement for this essential nutrient). Zinc has a unique function in the biochemistry and metabolism of plants. The ionic Zn in plants is essential to protect metalloproteins from damage by oxygen. Above or below optimal concentration levels of toxic Zn disrupt plant development [49]. Zinc is involved in multiple cellular and physiological activities of plants. Zn forms an essential structural, enzymatic and regulatory component of many proteins and enzymes. Zn has a key role in more than 300 enzymes across all six enzyme classes. Across all six classes of enzymes, Zinc is the only mineral found in excess. (Isomerases, Lyases, Ligases, Oxidoreductases, Transferases and Hydrolases) As an essential or catalytic enzyme, Zn changes and shapes the activity, structural integrity, and refolding of many proteins. In addition to its role as an essential part of ribosome structure, Zn has other major bio-physicochemical roles in plants, such as gene regulation and activation, protein synthesis, participation in carbohydrate metabolism, and bio-membrane morphological and anatomical involvement [50]. Furthermore, the interaction of Zn with phospholipids and the sulfhydryl groups of membrane proteins increases membrane stability.

As indicated by WHO, the centralization of Zn, which is viewed as safe for ingestion, goes from 100 to 500 mg/L. The consequence of examination of all plant tests under this review showed that the scope of Zn found in both plant species was within the recommended range, and it may be utilized securely as the end goal of a diet supplement. In correlation with the two types of plants, it was observed that the grouping of Zn was high in Allium cepa when contrasted with Cichorium intybus. About 10% of heavy metal pollution is generated by lead (Pb). Lead, which is brought in by plants, has an adverse effect on their metabolic functions, growth and photosynthesis [51]. It is not only toxic to them but also disrupts the biochemical processes within them. More than 42% of root growth may be decreased if the excessive accumulation of lead takes hold. Negative effects of Pb on plant growth and expansion have been recorded.

Lead in the soil can be released as free metal ions [52], coordinated with inorganic constituents of the soil or could exist as organic ligands (amino acids, fulvic acids and humic acids). Lead is possibly absorbed onto the particle surfaces (biological material, iron oxides, and organic matter). Soil lead can establish more than one ionic bond and is classified as a weak Lewis acid whose covalent character increases. Lead's distribution in soil is determined by several factors, including chemical processes such as oxidation and reduction reactions [53] and the adsorption of cations on an exchange complex: chelation by organic matter, metal oxides. Pb strongly combines with organic and colloidal matter in soils, so it is soluble, further making lead available for plant uptake. Soil pH plays an important role in soils' retention of lead. Experiments so far have shown that plants grown in soil take up more lead from acidic soils than they do from alkaline soils. In short, Pb is a major pollutant in ecosystems.

Free-Pb ions in the soil are taken up by the plants via the capillaries or by the cells of the respiratory tract of the atmospheric air. After lead is absorbed directly from the external atmosphere into the soil, it enters the plant system through its roots [54]. With their well-developed root system, plants transport nutrients from the soil into the plant body and divalent free-Pb cations, which are just as readily picked up from contaminated soil. These absorbed lead ions are then transported through the xylem vessels. The heavy metal moves through the plant system via the xylem vessels in upward flow along with other dissolved materials and unloads at the endoderm [55]. Also, because of the large surface area of plant leaves, this leaf allows the metal ions to be absorbed from polluted air via the cuticle and stomata, causing chlorosis in leaves. The tubular structure of the xylem vessels in plants transports water throughout the whole plant via flow direction and allows for unidirectional distribution on a massive scale. The translocation of metal ions moves through the plant system from the roots to other plant parts via xylem vessels, which is an upward flow parallel to other dissolved substances except colloids [56]. The chemicals then move to and accumulate in the endodermis of plants.

It is shown that lead destructiveness causes limitation of d-aminolaevulinic destructive dehydratase and debilitated mental ability. It also achieves a ruined turn of events and direct issues. Lead is considered destructive for both the central tactile framework and the periphery tangible framework. It obstructs the normal improvement of erythroid cells in bone marrow by interacting with vitamin D processing and calcium absorption. Various issues associated with lead toxicity are cerebral pain, weight loss, acrimony, irritability, hypertension, fatigue, premature births, and ineffective work. From different examinations, it is demonstrated that neurotoxic effects can result even at incredibly low concentrations of lead. A report on the inescapability of dental crisis in kids in Wales, Ceredigion, England, and the Tamar Valley communicated that dental crisis is related to high centralization of lead in soil open to plants. Concerning the Pb center in helpful plants used in this survey, the delayed consequence of assessment of all three instances of plant materials revealed that assembly of lead is higher in Allium cepa when it appeared differently in relation to Cichorium intybus. The extent of Pb, which is represented alright for plant food according to the World Health Organization, is 2 to 6 mg/L. All instances of plants under study showed the lesser center, which is ensured and exhibited clearly that this minor part in food supplements can be used safely.

Researchers could notice these symptoms of manganese (Mn) deficiency at an early stage, judging from an absence leaf color evident in such cases it might be just about fading, but not completely. It is a micronutrient necessary for plant growth and photosynthesis [57], so when it is in short supply, these functions will be affected. However, soil pH, soils with little or no clay in them, as well as overuse of nitrogen fertilizer or phosphate, can lead to manganese-deficient plants [58]. When the soil has too much free manganese and is acidic, Manganese toxicity will occur. On the older leaves, interveinal chlorosis is bright; there are signs of leaf-cupping. If this condition gets severe enough, your plant may eventually go necrotic altogether. Because of its multiple oxidation states that can be readily interconverted in vivo [59], Mn works as a cofactor and activator of countless plant metalloenzymes. It plays an important role within living organisms in a wide variety of enzyme-catalyzed reactions, including redox activities, phosphorylation, decarboxylation, and hydrolyzis. Different plant species have different tolerances for Mn. For example, beans, lettuce and potatoes are considered sensitive to higher Mn concentrations [60], while corn, rice, sugarcane and tomatoes are more tolerant of them.

The unsafe effects of manganese can result from both overexposure and deficiency. From high centralization of Mn neurological effects, step issues, development, mental issues, irritability, and crankiness could happen. Amyotrophic lateral sclerosis, which is a steadily advancing neurological disorder, reflects the absence of Mn. The low confirmation of Mn in the diet leads to decreased capacity to store supplement B1 (thiamin). In another report, as demonstrated by specific affirmations, it was recommended that Parkinson's disease may be associated with an excess of Mn. Beyond what many would consider possible for Mn as dietary, improvements of plant foods portrayed by the WHO are 2.5 to 5.0 mg. According to the assessment of every one of the three instances of the two plants under this audit, it is communicated that the gathering of Mn in Allium cepa is 514.13mg/kg and the centralization of Mn in Cichorium intybus is 701.001mg/kg. Because of its role in nitrogen metabolism and as a primary component of the enzyme urease, nickel is often listed as an essential micronutrient for all kinds of plants. When urease splits urea to give ammonia and carbon dioxide, it is acting as a kind of organic nitrogen fertilizer in the soil.

There are two different kinds of urease in plant tissues, one in seeds and another in direct seedling growth [61]. The urease of seeds is a highly active, ubiquitous urease, regardless of its importance to plants as a factor in nitrogen recycling. Ubiquitous urease breaks down potentially toxic levels of urea to give ammonium, and the plants can use the nitrogen in ammonium for other purposes. However, without a nickel, this crucial bacterial reaction cannot occur, and thus, amounts of toxic urea might build up in the plant.

Minor nickel deficiency has no visual effect but will reduce the growth and yield of crops. If nickel deficiency is severe enough, compartments with visible symptoms usually appear on older leaves or, in worst cases, they develop in germinating seeds [62]. Deficient legumes have whole-leaf chlorosis in which the tips become necrotic as toxic levels of urea are accumulated. Woody ornamentals normally show symptoms that are first apparent in the spring. These include short internodes (a kind of rosette), weak shoot growth, death of terminal buds, and finally death of shoots or branches themselves. In pecans, symptoms are very similar to those of woody ornamentals but also include decreased leaf blade expansion and tip necrosis. The leaflets take on an appearance that may be best described as "mouse-ear", in which they are small with rounded tips rather than long and pointed [63].

Nickel is a significant minor component for creatures and plants, yet in high concentrations, it is related to dangers to well-being, such as emphysema, impaired respiratory capacity, fibrosis, and persistent bronchitis. The most regularly detailed nickel harm is contact dermatitis in the general public. While investigating the Ni fixation in all examples of therapeutic plants utilized in this review, the results of the examination showed that centralization of nickel is higher in Allium cepa compared with Cichorium intybus. In Allium cepa, the concentration of nickel was under 0.05–5 mg/kg and in Cichorium intybus, the grouping of Ni was within the range revealed for plant food varieties characterized by the World Health Organisation.

Copper responds to various physiological processes in plants. It can exist in multiple oxidation states in vivo, and under physiological conditions, it exists as a Cu^{2+} ion or Cu^{+} ion. Cu ions activate target genes involved in photosynthesis and carbon metabolism after they are transported into the nucleus or chloroplast stroma; these metal ions also coactivate the Calvin cycle enzyme ribulose-1, 5-bisphosphate carboxylase because they have just bound to its gene [64]. Moreover, there is experimental evidence that supplementing growing cultures with low untreated Cu levels significantly accelerates chlorophyll degradation in tomato (Lycopersicon esculentum) leaves while increasing root lignification, an important aspect of plant structure and stress resistance. In the presence of laccase, copper serves as a cofactor for the transfer of electrons from a phenolic substrate to oxygen. There are only two known enzymes in green plants that require copper for their activities: laccase and polyphenoloxidase. At the cellular level, Cu plays an essential role in the signaling mechanisms of transcription and trafficking machinery for proteins, as well as oxidative phosphorylation and iron mobilization. Finally, for normal long-term growth and development, plants require Cu as an essential mineral element [65]. When it is missing, they develop characteristic symptoms of deficiency, most of which appear in young leaves and reproductive organs. In addition, due to its redox activity, Cu is both an essential element and a potent toxin.

Copper is a fundamental minor component for creatures and plants; however, in high concentrations, it becomes poisonous. Copper brings about Wilson's disease and metabolic issues [66]. In low fixation, the Kinky and Steel hair condition was accounted for. Zn-Cu association brings about ischemic coronary illness, which results from diminished admission of Cu with increased admission of Zn in both individuals and animals. As indicated by the World Health Organisation, the recommended amounts of Cu as plant food are 1-2mg for kids and 2-3mg for grown-ups. Cu focuses on the plants utilized under current examination exhibited that in Allium cepa is 31.541mg/kg, and the grouping of Cu in Cichorium intybus is 45.124mg/kg. The consequences of the study demonstrated that Cu is available in high fixation in Cichorium intybus, in contrast with Allium cepa, yet the grouping of Cu in all examples of both is within the body and can be utilized effectively as a food supplement.

Cadmium (Cd) is not a nutrient for plants and is, in fact, a toxic heavy metal that causes great harm to the growth and development of plants [67]. Although plants can take up Cd, they do not have any useful role for it, and its presence will interfere with various physiological and biochemical processes. Thus, in turn, it reduces growth yield or reduces nutrient utilization efficiency if too much is accumulated over an extended period. Soil pH, root exudates, organic matter, plant age, micro- and macronutrients, and plant genotypes affect the availability of Cd. However, soil pH is considered the most important factor influencing Cd availability [68]. There is a relationship between Cd uptake and soil pH. Reduction in soil pH results in an increase in Cd concentration of plants. Soil pH controls the ability of Cd to move into plants from the soil solution, but in many cases, increasing soil pH will not restrict plant uptake of Cd. When plants are exposed to toxic levels of Cd, they do not germinate normally; plant growth and yield are suppressed, and metabolic processes are abnormal in young seedlings. Reduction in yield can be significant, due to wilt and other phenomena. Therefore, the conclusion was drawn that a lack of water absorption is responsible for inhibiting Cd from taking effect in the seeds of cowpea [69]. As a result, insufficient nutrient supply leads to embolism occurring quickly in the developing seed and restricted growth of the embryo. Roots turned necrotic, decomposing, and mucilaginous following long-term exposure to Cd suppress the elongation of roots; leaf rolling and chlorosis are also results. In the soil rhizosphere, as a direct result of high concentrations of Cd, lateral roots do not develop well. The main plant's root becomes rigid, twisted and brownish from Cd. This is because of the abnormal expansion of cortical cell layers and the apical region in the epidermis. Cadmium may lead to the generation of reactive oxygen species through damage to chloroplasts. Cadmium toxicity can induce reactive oxygen species in the mitochondrial electron transfer chain. Treatment with Cd of rice and pea plants can induce the production of plasma membrane-bound nicotinamide adenine dinucleotide phosphate oxidase in peroxisomes and result in the formation of reactive oxygen species [70].

The grouping of cadmium in every one of the examples of the two plants was higher than the suggested safe threshold set by WHO. Cadmium, being a portable metal effectively absorbed from roots, is exchanged to different parts of plants and accumulated [71]. The ingestion of cadmium by the plants and its entrance into the pecking order mostly relies on the pH, natural matters, saltiness, and the capacity of the component to ingest [72]. Among the heavy metals, cadmium has less craving to bond with soil, balancing out stages including oxidases and works out, and it has a high capacity to be consumed by the plants and move to shoots or different parts to amass. This has the capacity to cross the cell layers of the roots, making it most likely to be assimilated by plants and to go into food varieties. It has diverse pharmacological impacts if its fixation is expanded. Then, it shows hereditary, neurological, provocative, and respiratory issues [73]. Cadmium's harmfulness prompted sickness, renal issues, sleep deprivation, hypertension, emphysema, and cardiovascular issues. As there is worry for the scope of Cd in therapeutic plants utilized under this examination, the effect of the investigation showed that the concentration of Cd is higher in Allium cepa compared with Cichorium intybus in all examples. The protected scopes of Cd, characterized by the World Health Organisation for plant food, are 0.06–0.07 mg/day.

The scope of Cd, which was found in therapeutic plants utilized in my review, is not within the cutoff defined by the World Health Organisation. Since ancient times, medicinal plants have played a significant role in the treatment of many diseases, and traditional knowledge has been transferred from one generation to the next. Nevertheless, in the last decades, many wildlife environments have been polluted by anthropogenic actions. Plants subjected to heavy metal toxicity may suffer several severe problems. Moreover, the involvement of these plants in the food chain and their effects on human health also represent a danger factor. Also, the presence of heavy metals directly influences mineral nutrition and, therefore, food quality. Several studies were conducted to analyze the heavy metal content and mineral nutrient status of some medicinal plants (Table 4) for insight into their health effects on both plants and humans. In general, pre-smelting and refining operations can be accountable for higher amounts of heavy metal concentrations, as highlighted by many researchers. This indicates that it is vital to ensure areas where medicinal plants grow are not polluted with heavy metals. If people are contaminated by these plants, the harm they cause is far greater than any benefit they may provide.

Table 4. Investigation of heavy metals and nutrition in specific plants

.	**Highlighted results**
Karahan and co-workers [74]	Concentrations of heavy metals in specific parts (plant from Turkey), such as seed, root, fruit, gall, rhizome, and resin, were investigated using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) Cadmium: 0.016–0.653 mg/kg Chromium: 0.379–30.708 mg/kg Copper: 23.838–90.444 mg/kg Iron: 78.96–1228.84 mg/kg Manganese: 12.11–362.57 mg/kg
Ajasa and co-workers [75]	Hyptis suaveolens: zinc and copper were found to be 35.1 and 24.4 ppm, respectively. Morinda Iucida: manganese and calcium were found to be 685 ppm and 51340 ppm, respectively. Ocimum canum: potassium, phosphorus and iron were found to be 36600 ppm, 3700 ppm and 241 ppm, respectively. Anacardium occidentale: concentration of sodium was 613 ppm. Azadirachta indica: lead and magnesium were found to be 0.49 ppm and 5630 ppm, respectively.
Saeed and co-workers [76]	Cichorium intybus leaves: vitamin A, E, K, C, B. This plant contained zinc, iron, sodium, magnesium and phosphorus.
Hideki and co-workers [77]	Basil leaf blades: sodium, potassium, and magnesium were 0.09, 25.15, and 9.5 mg/g, respectively. Basil stems: sodium, potassium and magnesium were 0.52, 41.19, and 6.58 mg/g, respectively. Basil roots: sodium, potassium, and magnesium were 10.93, 17.01, and 3.78 mg/g, respectively. Sage leaf blades: sodium, potassium, and magnesium were 0.59, 9.5 and 6.34 mg/g, respectively. Sage stems: sodium, potassium and magnesium were 1.9, 8.37 and 4.48 mg/g, respectively. Sage roots: sodium, potassium and magnesium were 7.55, 7.09 and 2.6 mg/g, respectively. Thyme leaf blades: sodium, potassium, and magnesium were 1.46, 36.95 and 5.07 mg/g, respectively. Thyme stems: sodium, potassium and magnesium were 1.56, 43.38, and 3.69 mg/g, respectively. Thyme roots: sodium, potassium, and magnesium were 3.68, 39.7 and 3.03 mg/g, respectively. Oregano leaf blades: sodium, potassium, and magnesium were 1.89, 17.97 and 3.66 mg/g, respectively. Oregano stems: sodium, potassium and magnesium were 1.86, 28.47 and 4.03 mg/g, respectively. Oregano roots: sodium, potassium, and magnesium were 5.23, 27.6 and 3.9 mg/g, respectively.

Boukeloua and co-workers [78]	Four fruits of the Pistacia species were studied. As: 18.4 to 22.1 µg/kg Cd: 1223.9 to 1371.3 µg/kg Cr: 2024.7 to 3571.5 µg/kg) Zn: 11372.7 to 19587.3 mg/kg Co: 138.8 to 142.7 µg/kg Cu: 9.1 to 25.2 mg/kg Pb: 293.2 to 9742.8 µg/kg Ni: 6807.1 to 7355.4 µg/kg Ag: 45.97 to 218.79 µg/kg
Qureshi and co-workers [79]	*Taraxacum officinale:* Roots and leaves consisted of iron, calcium, potassium, zinc, vitamin A, K, C and B.
Adamczyk and co-workers [80]	In dandelion plants, the concentration of heavy metals is strongly dependent on the presence of thiuram.
Krejpcio and co-workers [81]	Satureja hortensis: Pb (0.79 mg/kg), Cd (0.07 mg/kg), Cu (7.43 mg/kg), Zn (30.84 mg/kg). Cinnamomum zeylanicum: Pb (1.49 mg/kg), Cd (0.14 mg/kg), Cu (5.11 mg/kg), Zn (17.9 mg/kg) Myristica fragans: Pb (0.36 mg/kg), Cd (0.05 mg/kg), Cu (7.28 mg/kg), Zn (9.9 mg/kg) Syzygium aromaticum: Pb (0.25 mg/kg), Cd (0.01 mg/kg), Cu (4.2 mg/kg), Zn (6.8 mg/kg)
Arumugam and co-workers [82]	*Plectranthus amboinicus* (Lour.) Spreng: Carvacrol (29.25%), Thymol (21.66%), Humulene (9.67%), Undecanal (8.29%)
Ade and co-workers [83]	Sauropus androgynus: the highest mineral is magnesium (664.9 g/100g). Moringa oleifera has the highest mineral content, which is iron (490 g/100g). Carica papaya leaves have the highest mineral, which is potassium (676.2 g/100g).
Sultana and co-workers [84]	Marigold genotypes: potassium, calcium and iron were found to be 1564 to 1691, 157.6 to 225.3 and 55 to 109.3 mg/ 100 g, respectively.
Subramanian and co-workers [85]	Pudina: Fe (395.7 mg/kg) Pulichai keerai: sodium (782 mg/kg) Seru keerai: magnesium (135.9 mg/kg) Karivappillai: (97.36 mg/kg) Coriandrum sativum. L: Lead (2.87 mg/kg) Amaranthus dubius L: zinc (14.46 mg/kg)
Jose and co-workers [86]	The highest amount of heavy metal in shoots could be observed in Werneria nubigena (Zn=1691.03 mg/kg), Pennisetum clandestinum (Pb=236.86 mg/kg), and Medicago lupulina (Zn=1078.10 mg/kg) The highest amount of heavy metal in roots could be found in Juncus bufonius (Pb=718.44 mg/kg) and M. lupulina (Zn=2415.73 mg/kg)

5. Conclusion

More than the permissible limit, the concentration of heavy metals in medicinal flora is becoming a cause of concern for public health worldwide. To solve this problem and to ensure the importance of healthiness, the identification of the accumulation of heavy metals in medicinal plants used to treat several diseases is very important. Two medicinal plants, Ailium cepa and Cichorium intybus, were investigated in this study for the distribution of heavy metals and macronutrients. The findings of this review are valuable in helping us understand heavy metals such as cadmium, lead, and mercury and their health effects on humans. It is clear from this review that there are a few plant micronutrients and that their levels matter in the body. Plant growth is inhibited in the presence of heavy metals and their effects. More research is required to screen restorative plants for heavy metals, trace elements, and their functions in the traditional system. Heavy metal pollution of soil is a critical environmental problem that threatens human health, plant growth, and the food chain. Such heavy metals tend to remain in soil for extended periods, leading to chronic pollution and threats to the ecosystem. Heavy metal pollution usually comes from industrial production, mining, incorrect discarding of waste and agricultural processes. Action to avoid soil pollution. Emphasis should be given to minimizing sources of pollution, adopting sustainable practices, and treating polluted soils to avoid soil pollution. Such activities can include reduced use of pesticides and fertilizers, composting, organic farming, and soil remediation.

Funding Statement

The author (Ho SM) was financially supported by INTI International University, Malaysia.

Acknowledgments

This research work was financially supported by INTI International University (Ho SM).

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