

# Metal and pesticide residues levels accumulated in leafy vegetables and several fragrant medicinal plants in Baghdad Governorate / Iraq

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## Abstract

The levels of some heavy metals (cadmium, lead, chromium) and pesticide residues (Malathion, Dimethoate, Profernofoes, PrimiohosMe) were estimated in some aromatic medicinal plants (chamomile, anise seeds, coriander, fennel) and leafy vegetables (cabbage, celery, grape leaves, and coriander, Mint, lettuce, spinach, and watercress) are commonly used and collected from various markets. Organophosphorus pesticides have also been detected in some aromatic medicinal plants and leafy vegetables. Where, chamomile samples showed only Malathion, while in coriander malathion is 0.86 and Dimethoate have been detected in Anise seeds, profernofoes in chamomile were predominant, and leafy vegetables have also been detected some Organophosphorus pesticides in green mint Malathion, profernofoes is dominant, the findings showed that some heavy metals were present in some of the samples that were collected. Lead and chromium levels, as well as varying amounts of cadmium and chromium, were found in grape leaves in the majority of the samples that were examined. Samples of chamomile flowers had the greatest average amounts of cadmium and chromium, whereas samples of anise seeds had the highest levels of lead.

## Key word

## 1- Introduction

The aromatic medicinal plants have been widely known for clinically purposes or as raw materials for pharmaceutical, cosmetic and herbal medicinal products. You may be exposed to pollutants coming from the environment in which you grew, (1), Internal Route Furthermore, improper use of plant protection agents may cause heavy metals or pesticides to accumulate in plants, which could have an adverse effect on human health.. The use of medicinal plants may be the oldest way to overcome diseases. Phytotherapy has therefore been integrated into all traditional medicine systems, and is often the main source of health care in nations with low and medium incomes. The growing belief that "natural" equates to "harmless" has contributed to the rise in the usage of herbal products in affluent nations in recent decades. But as herbal products gain traction on the international market, there is growing worry about their safety from a public health standpoint. (2).(3) Many pollutants occur naturally in the Earth and in the atmosphere, such as radionuclides and metals. Some arise from past or current use of agents that pollute the environment and enhance medicinal plants such as factory emissions or persistent chemical wastes. Due to their excessive use and disposal, contaminants from environmental sources may be present even if the herbs are grown organically (4). Additionally, growing environments for medicinal plants, post-harvest processing of herbal materials (like fumigation), and product production stages (such as organic solvent residues) can all result in harmful pollutants (5). Medicinal plants are used in medicine for a very long time and are still a significant component of traditional medicine (6), (7), and They also contain special antioxidants. (8), Vitamins, phytosterols, essential oils, and a host of other phytonutrients support the immune system's defense of the body against bacteria, poisons, and viruses. and additional microorganisms (9) Generally speaking, microbial contamination of various kinds can be discovered in therapeutic plants and herbal materials, with bacterial and fungal diseases being the most prevalent (10). Weeds can be contaminated by harmful substances such as insecticides, heavy metals, mycotoxins, and pesticide residues in addition to biological contaminants. (11) for an extended period of time (12). Medicinal plants and herbal products must be safe for patients and consumers. Therefore, it is necessary

to establish a convenient quality control method to ensure the safety of herbal products. To prevent and screen pesticide residues and to ensure safety and compliance with quality standards, medicinal herbs and herbal products should be included in the appropriate regulatory framework. Herbs are classified as foodstuffs of plant origin under Regulation (EC) 396/2005 (13), (14). Due to the widespread use of plant protection products to protect weeds during cultivation, controlling their residues has become a necessity. In situations where herbs are prescribed as medications. In this study, a collection of leafy vegetable plants and aromatic medicinal plants were studied. Iraqi Governorate (15), (16) Many plants can become contaminated by metals, which poses a major risk to human health and can result in kidney damage, chronic toxic symptoms, kidney failure, and liver damage. Studies on the amounts of leftover harmful metals in medicinal plants have been carried out by more researchers (17). contamination of herbal medicine's raw ingredients Even minute amounts of ingested poisons have the ability to cause cancer (18). Reports on the amounts of toxins in spices and herbs are scarce. Numerous writers have written on medicinal plants (19), whose raw ingredients frequently contain a lot of molds, frequently from the soil. Microbial proliferation and increased contamination are caused by current methods of harvesting, handling, and production. The financial benefit of exporting therapeutic plants and the widespread application of some (20). Residues and contaminants accumulated in aromatic and leafy plants should be monitored to contribute to improving food safety and reducing actual and potential nutritional concerns, thus Assess potential health risks by providing Continuous information on environmental levels in the country. The current study included monitoring organophosphorus pesticides, as well as the survival of the heavy metals cadmium (Cd), lead (Pb), and Chromium (Cr) may also be present as a contaminant Some aromatic medicinal plants and leafy vegetables and pesticide residues (Malathion, Dimethoate, Profernofoes, PrimiohosMe) were estimated in some aromatic medicinal plants (chamomile, anise seeds, coriander, fennel) and leafy vegetables (cabbage, celery, grape leaves, and coriander, Mint, lettuce, spinach, and watercress)(21)

## 2. Experimental and Method

- A total of 50 samples of medicinal plants and leafy vegetables
  - the Aromatic medicinal plants were collected from the Herbal Center/Ministry of Health and leafy vegetable were collected from various local markets
  - 4 types of different medicinal plants, number of samples (25) and 8 types of leafy vegetables, number of samples (25) were taken, the total of samples is (50)
  - 500 grams of each type were finely ground
  - Removing impurities and unwanted materials from the sample, drying and grinding it
  - Following sample preparation, 15 grams are taken for the extraction process.
- Using a Soxhlet device, extraction is performed by placing the weight to be extracted into the designated tamper and adding 100 ml of the suitable solvent (methanol) to the volumetric flask of the Soxhlet gas in accordance with (22), (23).
- The extraction procedure lasts for three hours after the device has been configured and run, during which the solvent is passed over the sample seven times.
  - The extract (the solvent solution) is taken; - The extract is put in a rotating device at a temperature of 60–70 degrees to separate pesticides, oils, and organic materials.
  - The pesticide detector's GC-MASS device is injected after quantitative transfer and the addition of an appropriate solvent. to detection of pesticides organophosphorus and the heavy metal Residues aromatic medicinal plants and leafy vegetables plants were also measured by Atomic Absorption Flame Emission Spectrophotometer(AAS)s according to (24), (25).
- **Gas chromatograph Mass Spectrometer (GC- Mass) Analysis**  
Gas chromatography (GC-Mass) is a widely used technique that has been instrumental in figuring out how many and in what proportion of components are present in a mixture. However, its mass spectrum is reduced and it is unclear what the nature and chemical structure of these separated and quantified compounds are. If a high resolution mass spectrometer is utilized, the mass spectra reveal information on the functional groups present in the system as well as the molecular weight and elemental composition.
  - **X-ray Diffraction Analysis Technique:**

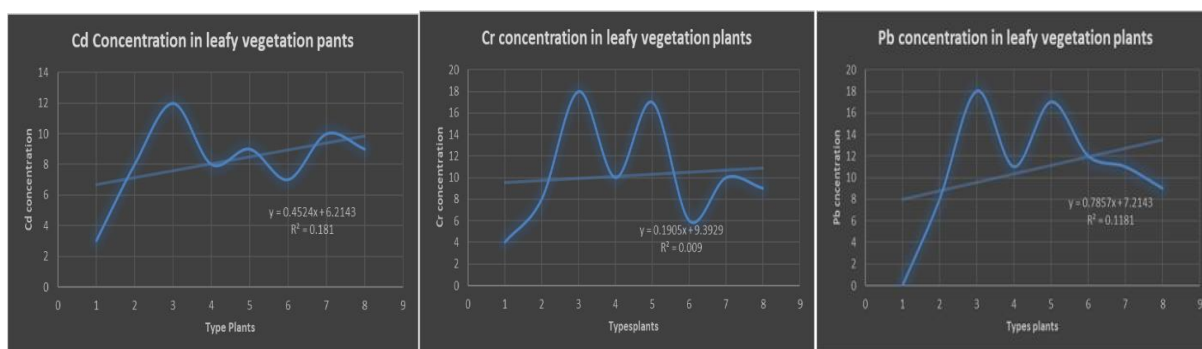
X-ray diffractometer (XRD-6000) was used to identify the qualitative analysis for compounds such as metals source, and the working voltage and current were 60 KV and 80 mA respectively. Diffraction patterns were manually analyzed according to the standard patterns of (ICDD) system .

### 3- Results and discussion

Lead and chromium are among the elements that had the highest concentration (18) in grape leaves, cadmium concentration was (12), and the lowest concentration of heavy metals was in tobacco (3) cadmium and (4) chromium, as shown in Table No. (1) and figure No (1):

**Table (1): Heavy metals residues Percentage %in leafy vegetable plants .**

leafy vegetable plants								
Metals	cabbage	celery	Grape leaves	Green coriander	Green mint	Lettuce	Spinach	Watercress
<b>Cd</b>	3	8	12	8	9	7	10	9
<b>Pb</b>	Nil	8	18	11	17	12	11	9
<b>Cr</b>	4	8	18	10	17	6	10	9

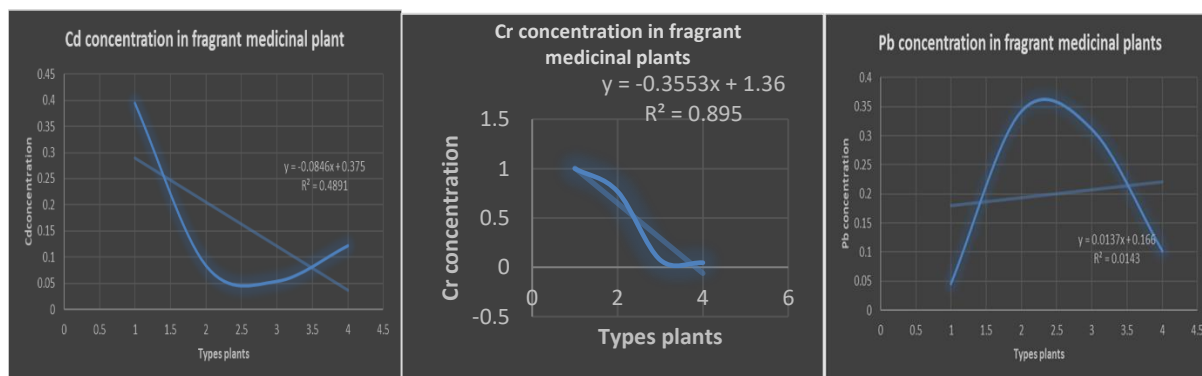


**Figure (1) : Cd,Cr,pd concentration in leafy vegetable plants**

The chromium ion was monitored at a concentration of 0.99 in chamomile and 0.394 in cadmium. lead concentration in anise seeds was 0.342, as shown in Table No (2) and Figure no (2) .

**Table (2): fragrant medicinal plants residues Percentage %in leafy vegetable plants .**

fragrant medicinal plants				
Metals	chamomile	Anise seeds	coriander	Fennel
<b>Pb</b>	0.046	0.342	0.311	0.102
<b>Cd</b>	0.394	0.084	0.054	0.122
<b>Cr</b>	0.999	0.768	0.074	0.046



**Figure (2) : Cd,Cr,pb concentration in fragrant medicinal plants**

The highest concentration for two types of organophosphorus pesticides (malathion, profernofes ) were detected in green mint and ( Dimethoate, Primiohos Me) was not found in all samples of medicinal aromatic plants as shown in Table No. (3).

**Table (3): Organophosphorus pesticides residues Percentage %in leafy vegetable plants .**

leafy vegetable plants								
pesticide residues	cabbage	celery	Grape leaves	Green coriander	Green mint	Lettuce	Spinach	Watercress
Malathion	Nil	0.08	0.13	4.1	5.1	Nil	Nil	Nil
Dimethoate	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Profernofoes	0.4	Nil	0.91	0.08	8.8	0.09	6.1	Nil
Primiohos Me	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

And malathion was detected in high concentration in chamomile and coriander ,profernofoes also detected in chamomile ,primiohos Me It was not found in the aromatic medicinal plant samples examined , as shown in Table No. (4).

**Table (4): Organophosphorus pesticides residues Percentage %in fragrant medicinal plants.**

fragrant medicinal plants				
pesticide residues	chamomile	Anise seeds	coriander	Fennel
Malathion	0.794	0.221	0.86	0.007
Dimethoate	0.449	2.09	0.221	0.314
Profernofoes	0.486	Nil	Nil	0.066
Primiohos Me	Nil	Nil	Nil	Nil

The organophosphorous pesticides, are widely used in agriculture to combat various insects. (26), These compounds have a higher acute toxicity than other chlorinated pesticides and have the advantage of decomposing more quickly in the environment. were mainly organophosphates (malathion, , profenofos Dimethoate). (27) The fact that medicinal plants can effectively treat a wide range of illnesses has led to their consideration. of illnesses and their active ingredients, which are safer than synthetic chemical drugs and may not have any side effects, are present in many pharmaceutical compounds., (28), (29), (30), (31). Conversely, oils might be essential to the breakdown of many pesticides, including cumin seeds. There are significant variations in the ways that different countries monitor the quality levels when it comes to pesticides because many pesticides are more soluble in oil than in water, unlike ginger, which has a high moisture content. In addition to having an impact on public health, the variations in pesticides and these goods also have an impact on global trade. The global use of pesticides has increased due to the increased amount of synthetic chemicals in them, posing serious risks to human health, malnutrition, and infectious diseases. (32) (33), (34). A large number of widely used pesticides nowadays can cause cancer in people. Research has indicated that pesticide use is linked to brain tumors, sarcomas, multiple myeloma, and cancers of the prostate, pancreas, lungs, ovaries, breasts, testicles, liver, kidneys, and intestines. Furthermore, the human nervous system may be harmed by pesticides (35, 36, 37).

#### 4- Conclusions

Medicinal plants and natural herbs must be used after applying safety tests, and the same country that produces medicinal plants , Leafy vegetable plants and spices (collected from natural or cultivated) must have at least one control laboratory capable of determining the residues of heavy metals and pesticides and giving a safety license for their use in safe ways. Additionally, it is advised to cultivate aromatic medicinal plants and leafy green plants without using any chemicals, and to store them in a pest-free environment. Planting them requires tested, secure soil that has been approved for agricultural use..

**Acknowledgment:** The authors would like to Ibn Sina University of Medical and Pharmaceutical Sciences, and Ministry of Science and Technology / Department of Environment and water in Iraq, Baghdad and its support in the present work and extremely grateful to all the people help us to get our data.

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