DETERMINATION OF LEAD, CADMIUM, MERCURY AND ARSENIC HEAVY METALS IN *RUMEX VESICARIUS* LINN. BY ATOMIC ABSORPTION SPECTROSCOPY METHOD

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Abstract:

Heavy metals are compounds or elements having relatively high density and toxicity at low concentration. Mercury, Cadmium, Arsenic, Chromium, Thallium and Lead are commonly found in plants it can be analysed by using Atomic Absorption Spectroscopy (AAS) method. Heavy metals are of two types. i) Toxic, ii) Essential Lead, Cadmium, Mercury and Arsenic are toxic heavy metals that causes metal poisoning to the patients. The purpose of the study is to determine the heavy metal content in the medicinal plant of Rumex vesicarius Linn. Plant, which has antiemetic, antibacterial, antioxidant, antidiarrheal, anthelmintic, anti-inflammatory, antipyretic, hepatoprotective, antimicrobial, antidiabetic, and free radical scavenging properties. The findings of this study were compared with prescribed limits of this metals in the WHO guidelines and the content of all heavy metals was found to be within safe limits. So, the dried powder prepared from this Rumex vesicarius Linn. is safe for further formulation studies in the view of heavy metal toxicity.

***Keywords**:*

Atomic Absorption Spectroscopy (AAS), Heavy metals, Rumex vesicarius Linn.

Introduction:[1,10]

Herbal medicines have a long history of usage in the treatment, prevention, and management of disease. The vast benefits that herbal medicines provide have led to the majority of the world's population relying on them in some way for various health benefits. According to World Health Organization research, traditional (alternative) medicine is used by 65 to 80 percent of the world's population as their major source of healthcare. The usage of herbal medications, on the other hand, has come under fire due to concerns about long-term toxicity, among other factors.

Rumex vesicarius Linn. is a member of the Rumex genus and Polygonaceae family. Antiemetic, antibacterial, antioxidant, antidiarrheal, anthelmintic, anti-inflammation, antipyretic, antimicrobial, antidiabetic, hepatoprotective, and anticancer are some of the ailments for which it is commonly used as a medicinal herb. West Punjab, the Trans-Indus Hills, Afghanistan, Persia, and North Africa are all home to the plant. Grown in the Bombay presidency's garden areas at any time of year. *Rumex vesicarius* Linn. is a succulent herb that grows to be 15-30cm tall and dichotomously branched. Fleshy, sour alternating leaves that are elliptic-ovate, broadly ovate, whole, acute/obtuse at base, and have a long petiole. Flowers are monoecious and white. Nutlets are the fruits, and the seeds are erect and trigonous. Anthraquinones: emodin and chrysophanol, flavonoids, C-glycosides: vitexin, isovitexin, iso-orientin, rumicine, lapathine, oxalic acid, tannins, mucilage, mineral salts, and vitamin C.

Metal residues are common in herbal plants because they are easily contaminated during their growth, development, and processing. Heavy metals trapped in plants eventually enter the human body after being collected and transformed into medication form, where they may disrupt the normal operations of many organ systems. The World Health Organization has

underlined the importance of quality assurance for herbal products, including heavy metal testing.

Using the atomic absorption spectrometry method, four elements, Pb, Cd, As, and Hg, were quantified in herbal lozenges formulations.

Materials and methods:

Sample collection and preparation:

The therapeutic herb was purchased in Tiruchirappalli district. Plant identification was carried out at the National College, Department of Botany in Tiruchirappalli, Tamil Nadu. The samples were washed and air-dried at room temperature for one week in a dust-free environment before being ground into small particles. Prior to examination, the powdered samples were placed in plastic containers and stored in a dry cabinet.

Procedure

Estimation of Mercury by AAS:

Prepare mercury standards (NIST traceable) in distilled water to 0.001, 0.002, 0.003, 0.004, 0.005& 0.01 mg/L from a 1000ppm solution. Fill 300 ml BOD bottles with a weighted sample. To each bottle, add 50 mL of concentrated sulfuric acid and 25 mL of nitric acid. Allow 15 mL of a 5% potassium permanganate solution to stand for at least 15 minutes before using. Heat each 8 mL of 5 percent potassium persulphate solution in a water bath at 95°C for 2 hours. To remove excess permanganate, cool and add 6ml sodium chloride hydroxylamine sulphate solution. Add 5 mL of stannous chloride solution after decolorization. Connect the BOD bottle to the aeration device right away to create a closed system. Add 5 mL of stannous chloride solution after decolorization. Connect the BOD bottle to the aeration device right away to create a closed system. Remove the BOD bottle from the aeration equipment once the reaction is complete, establishing a closed system. Process the blank and standards in the same way as before. Set the AAS according to the task instructions. Aspirate the blank, reference, and sample solutions. Measure the mercury's absorbance at 253.7 nm.

Estimation of Lead by AAS:

Take a normal flask with a capacity of 100 mL. Prepare lead standards (Nist traceable) in nitric acid (1:499) from 1000 ppm solution to 0.01,0.02,0.04,0.06,0.08 &0.1 mg/l. In 100 mL distilled water, make a blank solution. In a beaker, weigh the sample and digest it with 10 mL concentrated Nitric acid and 50 mL hydrochloric acid until the volume is decreased to three-quarters. Cool to room temperature and create up to 100 mL with distilled water. Process the blank in the same way as before. Set the AAS according to the task instructions. Remove the blank, standards, and sample solutions from the aspirator. Calculate the Lead's absorbance.

Estimation of Cadmium by AAS:

Take a normal flask with a capacity of 100 mL. Prepare Cadmium standards (Nist traceable) in Nitric acid (1:499) from 1000ppm solution to 0.03,0.05,0.07,0.09,0.10 mg/l. In 100mL distilled water, make a blank solution. In a beaker, weigh the sample and digest 50ml hydrochloric acid until the volume is decreased to three-quarters. Cool to room temperature

and create up to 100 mL with distilled water. Process the blank in the same way as before. Set the AAS according to the task instructions. Remove the blank, standards, and sample solutions from the aspirator. Calculate the Cadmium's absorbance.

Estimation of Arsenic by AAS:

Take a 5g sample and place it in a 200ml beaker. 10 mL 2.5N sulphuric acid (4.2) and 50 mL potassium persulphate (5% potassium chloride) (4.3). Make up to a 50ml standard flask by boiling until the final volume is reduced to 10 mL. From a 1000ppm solution, prepared arsenic standard solutions of 0.005, 0.0075, 0.01, 0.02, 0.04 & 0.05 mg/L in distilled water. 50 mL digest sample in a 200 mL beaker Wait 30 minutes after adding 5ml of concentrated hydrochloric acid and 5 mL sodium iodide solution. 0.5 mL sodium borohydride solution is added. Assemble the blank and working standards as described above. For AAS operation in VGA, follow the job instructions. Remove the blank, standards, and sample solution from the aspirator. Determine the absorbance of arsenic at 193.7 nm.

Results and discussion:

The levels of heavy metal present in the *Rumex vesicarius* Linn. was discussed and the concentration of As, Cd, Hg, and Pb in the *Rumex vesicarius* Linn. is presented in Table. The heavy metals analysed in the dried herb of *Rumex vesicarius* Linn. are less than the permissible limits of 0.01 mg/kg.

It is concluded that heavy metals present in *Rumex vesicarius* Linn. carried using by Atomic Absorption Spectrophotometer were found to be within the standard prescribed limits. The results obtained by this study, concluded that the dry powder of *Rumex vesicarius* Linn. can be preferred to consume by humankind for various medicinal purposes.

Table 1. Heavy metals in *Rumex vesicarius* Linn.

S.NO	HEAVY METALS	RESULTS
1	Lead	BDL(DL:0.01mg/kg)
2	Cadmium	BDL(DL:0.01mg/kg)
3	Mercury	BDL(DL:0.01mg/kg)
4	Arsenic	BDL(DL:0.01mg/kg)

*BDL: Below Detection Limit

DL: Detection Limit

Conclusion

The plant species tested to have safe amounts of the heavy metals and hence may have no harmful impacts are generally linked with heavy metal toxicity on people who use these products for their health needs.

Acknowledgement

The authors are grateful to the Founder Chairperson Dr. K. Veeramani of Periyar College of Pharmaceutical Sciences, Trichy-21, for extending necessary facilities to carry out this Research.

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