ISSN 2456-3110
Vol 8 · Issue 5
May 2023

JAiMS
INTERNATIONAL

Journal of Ayurveda and Integrated Medical Sciences

www.jaims.in

JAIMS

An International Journal for Researches in Ayurveda and Allied Sciences

Maharshi Charaka
Ayurveda

Indexed

Journal of
Ayurveda and Integrated Medical Sciences
ISSN 2456-3110
ORIGINAL ARTICLE May 2023

Evaluation of *Changeri Masi* (*Oxalis corniculata* Linn.) in altering the copper concentration in water

Maneesha K[1], Chaitra H[2], Y Rajeswari[3]

[1,3]*Post Graduate Scholar, Department of Agada Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan, Karnataka, India.*

[2]*Associate Professor, Department of Agada Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan, Karnataka, India.*

ABSTRACT

Introduction: The presence of heavy metals in water has been increasing with industrial growth and human activities. The major source of copper in drinking water is corrosion of household plumbing, faucets, and water fixtures. Most commonly used copper salt is copper sulphate (CuSO4. 5H2O). It is used as a general pesticide rated as toxicity class 1 highly toxic. Unfortunately, most people are not aware of the safe level and they overuse it causing residue in soil, water, which endangers human and environment. According to EPA the permissible amount of copper in drinking water is 1.3mg/L. As Cu is non-biodegradable, poisonous, and easy to accumulate in living organisms in general and especially in the human body at low concentrations; they can cause major illnesses such as cancer, nervous system damage, and kidney failure, and can be fatal at high doses. hence, it's important to remove Cu metal from water as well as wastewater**. Materials and Methods:** *Changeri* (*Oxalis corniculata* Linn.) plant is collected as a whole, dried and prepared *Changeri Masi* (ash) out of it. Copper contaminated water was prepared by adding copper sulphate in distilled water. Amount of copper were evaluated with AAS and fixed to 3mg/L. Different concentration of *Changeri Masi* was added to copper contaminated water and keep it for different contact time. **Results:** *Changeri Masi* mixed copper water filtered through a filter paper and reading was taken in atomic absorption spectroscopy. Significant reduction in copper was observed.

Key words: *Analytical Study, Atomic Absorption spectroscopy, Changeri Masi, Copper, Copper sulphate.*

INTRODUCTION

With the expansion of industry and human activity, heavy metals have become more prevalent in water. The heavy metal-contaminated water enters the environment and negatively impacts both the ecosystem and human health. Since heavy metals are non-biodegradable[1] and may cause cancer,[2] their presence in excessive amounts in water may have serious negative effects on the health of living things.

Copper (Cu) is one of the most important elements and is considered as one of the most widely used metals in various industrial and agricultural practices.[3] Cu frequently discovered in high concentrations in waste water as it is widely utilized in the industrial applications, including metal polishing, electroplating, plastics, agricultural and domestic pesticide and fungicide use are all anthropogenic sources of copper in the environment.[4] The major source of copper in drinking water is corrosion of household plumbing, faucets, and water fixtures. Water absorbs copper as it leaches from plumbing materials such as pipes, fittings, and brass faucets.

Address for correspondence:
Dr. Maneesha K
Post Graduate Scholar, Department of Agada Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan, Karnataka, India.
E-mail: mkmaneeshak47@gmail.com

Submission Date: 10/03/2023 Accepted Date: 16/04/2023

Access this article online

Quick Response Code

Website: www.jaims.in

DOI: 10.21760/jaims.8.5.4

ISSN: 2456-3110 ORIGINAL ARTICLE May 2023

According to EPA the permissible amount of copper in drinking water is 1.3mg/L.[5] Pure metallic copper is safe; however, many copper salts are toxic. Copper sulphate (CuSO4/5H2O) is the copper salt that is most frequently used. It is a commonly used insecticide with a very dangerous class 1 rating. Unfortunately, most people go beyond that because they don't know the right amount to use, leaving residue in the soil and water that puts both people and the environment in peril. According to studies, copper sulphate from crop fields can now reach water-containing aquifers beneath the earth. Consumption of this water leads to chronic toxicity in body. Chronic poisoning of copper result in abdominal pain, greenish line on dental margin of gums (Clapton's line), lung disease in vineyard sprayer's, greenish discoloration of hair, anaemia, hepatic and renal diseases consequences such as vomiting, cramps, convulsions, and even death.[4]

All over the world, rural communities have adopted simple & rudimentary treatment technique that mainly aim at filtering out the visible impurities from the water collected from local sources. Though these traditional methods are expedient & can remove certain type of particles in water, they do not provide necessarily of what would be considered, under the present-day situation. Removal of heavy metals from industrial wastewater is becoming more expensive due to non-biodegradability, toxicity, carcinogenic and extremely high cost.[4] There has been a surge in research interest in creating new adsorbents that can be utilised for this purpose in order to promote the use of more cost-effective and environmentally friendly water treatment techniques. Adsorption produces a high-quality purified product and is more affordable, flexible, and effective than other processes like chemical precipitation, electrochemical technologies, ion exchange, membrane filtration, and others.[6] It is also simpler to design, easier to operate, and unaffected by toxic pollutants.

As Cu is non-biodegradable, poisonous, and easy to accumulate in living organisms in general and especially in the human body at low concentrations; they can cause major illnesses such as cancer, nervous system damage, and kidney failure, and can be fatal at high doses.[3] Hence it's important to remove Cu metal from water as well as wastewater. *Changeri* (*Oxalis corniculata* Linn.) is a drug used in classics for the purification of copper.[7] It is from Oxalidaceae family. *Changeri* is one of the important drugs used in *Siddha* and Ayurvedic systems of medicine for the treatment of *Grahani, Athisara* (diarrhoea), *Kushta* (skin diseases), *Arsas* (piles). It is of *Amla* (sour) *Kashaya Rasa* (bitter), *Usna Veerya* (hot in potency) and *Kapha Vatahara*. It is *Laghu* (light) *Rooksha* (Dry) and *Amla Vipaka*. It is *Deepana* (digestive) and *Grahi*[8] have oxalic acid, potassium, carotene tartaric acid and citric acids, calcium oxalate, flavones, glycoflavones, and phenolic acids such as phydroxybenzoic, vanillic and syringic acids.[9]

So, the removal of copper ions from waste water is an immediate need, as far as *Changeri* is selected due to its easy handling, easy availability and cost effectiveness.

Aims and Objectives

1. To analyse the effectiveness of *Changeri* in copper contaminated water
2. To analyse the effectiveness of *Changeri* in copper contaminated water at different contact time.

Materials and Methods

Changeri Masi preparation

Changeri is collected as a whole and dried under shades, later prepared ash out of it by heating in iron pan.

Preparation of copper water

- For the preparation of copper solution. 5g copper sulphate is added into 500ml distilled water in a standard flask.
- From that 10ml solution is taken and mixed with 100ml of distilled water and obtained solution was containing 100mg/l copper
- From the above solution we took 3ml solution and mixed with 100ml distilled water and obtained solution containing 3mg/l copper solution.

ISSN: 2456-3110 **ORIGINAL ARTICLE** May 2023

1. Effect on adsorbent dose

For selecting a fixed effective dose of *Changeri Masi*. 5g, 1g, 1.5g, 2g was added to copper contaminated water with fixed contact time of 60min.

Table 1

SN	Sample	Leftover copper concentration
1.	0.5g *Changeri Masi*	0.14mg/L
2.	1g *Changeri Masi*	0.758mg/L
3.	1.5g *Changeri Masi*	0.568mg/ L
4.	2g *Changeri Masi*	0.869mg/L

Details of sample in the analysis of effective dose fixing of *Changeri Masi*.

From this experiment it is clear that at 0.5g concentration of *Changeri Masi* gives maximum adsorption of copper.

2. Effect on contact time

Table 2

SN	Contact time
1.	30 min
2.	60 min
3.	90 min

Effect on contact time with 0.5g *Changeri*

Figure 1: *Changeri Masi* mixed water after filtration

OBSERVATIONS AND RESULTS

Table 3

SN	Contact time	Left over copper
1.	30 min	0.04 mg/l
2.	60 min	0.14 mg/l
3.	90 min	0.25 mg/l
4.	120 min	0.001mg/l

Effect on contact time with 0.5g *Changeri*

Removal of copper was effective in 120 min of contact time.

DISCUSSION

Heavy metals from waste waters brought on by industrial and human activity can be effectively removed from the water using adsorption. Its definition comprises the passive removal of harmful chemicals by dead, inactive, or biologically generated materials.

Table 4

	Test	Aqueous	Alcohol
Alkaloid	Wagner's test	+	+
Carbohydrates	Fehling's test	-	+
Tannins	Lead acetate solution	+	+

Table 5: Primary Physiochemical study of *Changeri*

SN	Chemical constituents	Ethanol	Aqueous
1.	Carbohydrates	+	+
2.	Proteins	+	+
3.	Amino acids	+	+
4.	Glycosides	+	-

ISSN: 2456-3110 ORIGINAL ARTICLE May 2023

5.	Flavanoids	+	+
6.	Alkaloids	-	+
7.	Phenols	+	+
8.	Volatile oils	+	+
9.	Tannins	+	+

Physiochemical study of *Changeri*[10]

Effect on concentration

Following tests using *Changeri Masi* concentrations of 0.5g, 1g, 1.5g, and 2g, it was discovered that the largest amount of copper was adsorbed at the 0.5g concentration. As most studies use 60 minutes as their standard time, 60 minutes were used in this trial as the contact time to determine the effective concentration of *Changeri Masi*. Varying the dosage could impact the initial resistance to film diffusion and equilibrium concentration. Here, Adsorption is maximised at a 5g dosage. Increasing the dose of the adsorbent didn't increase adsorption because the sorbent may have become saturated.

Effect on contact time

The elimination of copper is also greatly influenced by contact time. The least amount of absorption occurs here after 90 minutes of contact time, and the most, or nearly none, occurs at 120 minutes.

Changeri is a drug mentioned for copper purification.

Changeri possesses *Amlakashaya Rasa, Leghu Rooksha Guna, Ushna Veerya* and *Amla Vip*aka as therapeutic properties. *Changeri* is *Kapha Vata Haram, Deepanam*. It is used in diseases like *Grahani, Atisara, Arsa* (piles) and *Kushta* (Skin diseases). *Changeri* is used in Ayurvedic preparations like *Changerigrita* which is used in diseases like *Arsa, Grahanidosha, Anaha Mutrakrichara, Pravahika* and *Gudabramsha*.[8] It is used in *Siddha* preparations like *Uppuchenduram* which is used in the treatment of *Pitta* disorder colic, burning sensation of the chest, hyper acidity, indigestion.[11] Researches regarding *Changeri* nutritional values showed that it has many nutritional values which have benefits to humans. Among them, the soluble carbohydrate content was found to be the highest values (26.65%) in the *Oxalis corniculata* plant sample. Energy value of plant sample was 184.73 kcal per 100 g. It can be concluded that the *Oxalis corniculata* plant sample contains the valuable phytochemicals for human's health and nutritional values for the maintenance of the body.[12]

The current international trend towards attaining greater environmental standards encourages the employment of accessible and environmentally friendly methods for treating waste water. *Changeri* is a cheap, easy available drug that can be used to remove copper ions from water.

Conclusion

The concentration of 0.5 g of *Changeri Masi* at 120 minutes of contact time results in the highest copper absorption. After filtration it gives a slight yellow colour and no fragrance to the water. Since it is very easy to prepare it can be used for copper purification from water.

References

1. El-Sherif, I. Y., Tolani, S., Ofosu, K., Mohamed, O. A. & Wanekaya, A. K. Polymeric nanofibers for the removal of Cr(III) from tannery waste water. J. Environ. Manag. 129, 410–413 (2013).
2. Zou, Y. Et al. Environmental remediation and application of nanoscale zerovalent iron and its composites for the removal of heavy metal ions: a review. Environ. Sci. Technol. 50, 7290–7304 (2016)
3. Al-Saydeh, S.A.; El-Naas, M.H.; Zaidi, S.J. Copper removal from industrial wastewater: A comprehensive review. J. Ind. Eng. Chem. 2017, 56, 35–44.
4. Ab Hamid NH, bin Mohd Tahir MI, Chowdhury A, Nordin AH, Alshaikh AA, Suid MA, et al. The current state-of-art of copper removal from wastewater: A Review. Water. 2022;14(19):3086.
5. Cdn-ext.agnet.tamu.edu. 2021 [cited 6 July 2021]. Available from: https://cdnext.agnet.tamu.edu/wp-content/uploads/2019/04/EL5472-drinking-water-problemscopper.
6. Demcak, S.; Balintova, M.; Hurakova, M.; Frontasyeva, M.V.; Zinicovscaia, I.; Yushin, N. Utilization of poplar

ISSN: 2456-3110 **ORIGINAL ARTICLE** May 2023

wood sawdust for heavy metals removal from model solutions. Nova Biotechnol. Chim. 2017, 16, 26–31, doi:10.1515/nbec-2017-0004

7. Angadi R, Sadānandaśarmā, Sadānandaśarmā. In: Rasa taraṅgiṇī: āyurveda Pharmaceutics & Indian alchemy of śrī sadānanda śarmā: With 'transcendence' descriptive English commentary. Varanasi: Chaukhamba Surbharati Prakashan; 2015. P. 274.
8. Sastry J.L, Illustrated Dravya Guna vijnana, Vol 2, Chaukhambha Orientalia,2004. p.104.
9. Srikanth M, Swetha T, veeresh B, Phytochemistry and pharmacology of *Oxalis corniculata* linn.: a review, international journal of pharmaceutical science and research. 2012:3(21) 4077-4085
10. Karunanithi S, Rajkishore VB, Pol vandhanaganesh, M smumthana, Abirami. D, Jayshree Dr. Pharmacognostical and phytochemical studies on leaves of *Oxalis corniculata* Linn. The Journal of Phytopharmacology. 2016;5(6):225–9.
11. Z. Mary, K.G Vasantha, P saraswathy,T. Bikshapathi, pharmacognostical studies on *Changeri Oxalis corniculata* linn. (oxalidaceae), Ancient Science of Life.2001: 2(21)120-127
12. San San Htay, Phyu Phyu Lwin, Swe Zin Myint. Determination of Phytochemical Constituents and *Oxalis Corniculata* Linn. (Hmo-na-do) By Thin Layer Chromatography Method and Its Nutritional Values. 3 rd Myanmar Korea Conference Research Journal Volume 3, No. 5 :1785-1793. A Semantic Study of Taste-related Words in the Myanmar Language (dagonuniversity.edu.mm)

How to cite this article: Maneesha K, Chaitra H, Y Rajeswari. Evaluation of Changeri Masi (Oxalis corniculata Linn.) in altering the copper concentration in water. J Ayurveda Integr Med Sci 2023;05:21-25. http://dx.doi.org/10.21760/jaims.8.5.4

Source of Support: Nil, **Conflict of Interest:** None declared.

****