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ANCIENT METHODS OF CONTAMINATED LAND PURIFICATION. (VISHA DHOOSHITA BHOOMI SHODHANA): A COMPREHENSIVE REVIEW

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ABSTRACT

Soil contamination poses significant environmental and health challenges, requiring effective and sustainable remediation strategies. There are centuries-old soil purification techniques that could complement modern phytoremediation practices. This paper explores how these ancient methods can be integrated into contemporary soil remediation approaches to enhance their effectiveness. A comprehensive review of the classical literature was conducted. This study aimed at studying the method of soil purification through traditional methods. These methods were compared with the currently practiced techniques of phytoremediation and sustainable agriculture for compatibility and possible interaction in this context.

Ancient texts mention detailed methods of purifying the soil using herbal decoctions, cow products, and other specific plants etc. Such techniques evince considerable affinity with the prevailing phytoremediation techniques widely practiced today. The study underscores the relevance of Ayurvedic principles in addressing soil contamination, especially in the context of sustainable agriculture. Ayurvedic techniques, such as using herbal preparations, organic matter, and phytoremediation plants, offer promising solutions for soil remediation. However, further research is needed to evaluate their large-scale applicability and long-term sustainability. Incorporating Ayurvedic moral and ethical frameworks into modern environmental management could provide a holistic approach to addressing pollution at its root. Integrating Ayurvedic soil purification techniques with modern phytoremediation and sustainable agriculture could improve soil contamination management. This combined approach offers a holistic solution to soil pollution, though further research is required to assess its practical effectiveness in diverse and large-scale environmental contexts.

Key words : Soil, *Bhoomi shodhana* , Environment, Contamination, Phytoremediation

INTRODUCTION: Ayurveda, offers a comprehensive framework that emphasizes the interrelation between human health and the environment. This holistic approach recognizes that the environment is an integral part of human life, and its

degradation directly affects the well-being of individuals and communities.

In Ayurveda, environmental pollution is seen not merely as a physical problem but as a consequence of moral and ethical degradation, or *Adharma*. The classical Ayurvedic texts, particularly the Charaka

Samhita and Sushruta Samhita, provide detailed discussions on the causes, effects, and remedies for environmental and land pollution. These ancient insights remain profoundly relevant in addressing contemporary environmental challenges.

AIMS

The study aims to explore traditional and Ayurvedic methods for soil purification and assess their potential to complement modern soil remediation for a more sustainable approach to soil contamination.

OBJECTIVES

Traditional and Ayurvedic texts were analyzed for soil purification insights, and comparisons were made with contemporary methods. Recent research studies on integrating Ayurvedic practices with phytoremediation were reviewed to identify feasible applications and areas needing further study.

MATERIALS AND METHODS

To explore the Ayurvedic perspective on soil contamination and purification, a literature review was conducted using primary sources such as the Charaka Samhita, Susruta Samhita, Vedic texts, texts on *Vrikshayurveda*, and other Ayurvedic texts, along with modern interpretations."

These ancient texts offered insights into traditional approaches for purifying soil, concentrating on identifying and treating what is known as *Dooshita*, or contaminated, *Bhoomi*.

A systemic review of these literature was carried out to find out the causes and characteristics of soil pollution, as well as ancient soil remediation methods involving herbal decoctions, cow products, mantras, and other rituals. Additionally, a literature review of modern phytoremediation and sustainable

agriculture practices was performed to explore compatibility with these Ayurvedic techniques.

Charaka Samhita

The concept of environmental pollution in Ayurveda is closely associated with the term *Janapadodwamsa*, which is discussed in the Charaka Samhita *vimanastana* chapter 03. *Janapadodwamsa* refers to the large-scale destruction or devastation of communities due to environmental degradation.

According to Charaka Acharya "By unrighteousness, righteousness is destroyed swiftly; righteousness flourishes in the world, and by righteousness, people are sustained". This *shloka* underscores the idea that the degradation of moral values among rulers and citizens leads to environmental decay, which then manifests as widespread health crises and the destruction of communities. The root cause of such destruction is *Adharma*, or unrighteousness, which leads to the disturbance of the natural balance in the environment.^[01]

Charaka describes four major environmental elements - air (*Vayu*), water (*Jala*), land (*Desha*), and seasons (*Kala*) - that can become polluted as a result of human actions. These polluted elements, in turn, contribute to the spread of diseases and the overall decline of health in a population.

Sushruta Samhita

In Sushruta Samhita *Kalpasthan*, Chapter 3 expands on this concept by highlighting the role of deliberate human actions in causing environmental pollution. The text describes how weaker kings, in their attempts to protect their territories during warfare, would introduce poisons into the environment. These acts of sabotage

involved contaminating air, water, and soil with toxic substances, thereby causing harm not only to the enemy but also to the broader ecosystem and the general population.

In Shushruta Samhita, it is mentioned that in efforts to protect one's army and land the weaker king introduces various types of poisons in land water and air in the way of a strong king and thus causes deliberate harm to the environment and other living beings including human. [02]

In those times, the royal physician was responsible for detecting toxic environmental conditions, cleansing the affected areas, and treating individuals impacted by the contamination.

Dooshita Bhoomi

Reasons for pollution of Land:

In Ayurvedic literature, land (*Desha*) is one of the four critical environmental elements susceptible to pollution. The *Charaka Samhita* attributes land pollution to *Adharma*, such as greed and ignorance, leading to the exploitation and degradation of natural resources. Pollution occurs when soil is contaminated by harmful substances from improper agricultural practices, industrial waste, or deliberate sabotage during conflicts. The *Sushruta Samhita* provides historical examples of land pollution, particularly during war, where enemies would poison water, food, and air, rendering land unsuitable for use. It emphasizes the role of the royal physician in identifying and purifying these contaminated areas to restore environmental balance and public safety.

Properties of vitiated Bhoomi:

As per the *Charaka Samhita*, *Janapadodvansaniya vimana*, contaminated land or areas can often be recognized by various signs, such as

unusual odors, strange colors, or unexpected textures. Excessive dampness and an abundant pests like serpents, predators, mosquitoes, locusts, flies, and mice might also be indicators. Other signs include overgrowth of weeds, overly tangled creepers, and crops that are withered, fallen, or destroyed. Additionally, environmental cues like smoky winds, constant wild bird cries, persistent dog barking, disturbed and agitated wildlife, overflowing water bodies, and frequent occurrences of natural disturbances like thunder, meteorites, and earthquakes may be present. The atmosphere might also seem chaotic, tense, or dark. [03]

Complications of using contaminated Bhoomi:

Susruta Acharya states that in areas with contaminated ground, stone slabs, landing stages, or desert regions, any contact with these surfaces can cause swelling in the parts of the bodies of humans, cattle, horses, donkeys, camels, and elephants that come into contact. This contact often leads to a burning sensation in the affected areas, and may also result in the loss of hair and nails in those regions. [04]

Bhoomi shodhana Vidhi (Soil Purification Methods)

Vedic Period

The *Rig Veda* and *Yajur Veda*, two of the oldest texts in Indian literature, provide insights into the relationship between humans and nature, particularly regarding land and soil management. Although the Vedas primarily focus on spiritual and ritualistic content, they also contain references that can be interpreted as early forms of agricultural and soil management practices.

Rig Veda

The *Rig Veda* is one of the oldest texts in Indian literature, and while it does not explicitly outline soil purification methods, it includes hymns and verses that suggest a deep understanding of maintaining environmental purity, including that of the soil.

Yajnas (Sacrificial Rituals)

Role of Agnihotra: The *Agnihotra* ritual, a key part of the *Rig Veda*, was performed to purify the environment, including the soil. The fire rituals involved offerings of ghee, grains, and other natural substances into the fire, with the belief that the smoke and ashes would cleanse the surrounding environment, including the land.^[05]

Purification through Soma Plant:

"The *Soma*, once purified, is offered to Indra to drink and is praised with great reverence.".

The *Rig Veda* frequently mentions the *Soma* plant (Uncertain) and its juice, which was considered sacred and purifying. The cultivation and use of *Soma* were believed to cleanse the land, as the *Soma* rituals were directly linked to maintaining the purity of the environment.^[06]

Yajurveda :The *Yajur Veda*, which serves as a manual of rituals, contains more direct references to purification techniques that could be applied to contaminated soil.

Use of Mantras and Rituals

Rituals for Cleansing the Land:

The *Yajur Veda* includes rituals specifically designed to purify the land, particularly before significant agricultural or construction activities. These rituals often involved the recitation of specific mantras and the sprinkling of water mixed with herbs and other purifying agents over the land.

"May the god *Savitar*, instill in you the

best energy and strength for your work."

This mantra, often recited during land purification rituals, calls upon divine energy to cleanse and prepare the land for use, ensuring it is free from impurities.^[07]

Use of Cow Products

Gomutra (Cow Urine) and Cow Dung:

In the *Yajur Veda*, cow products are considered highly purifying. Cow urine (*Gomutra*) and cow dung were commonly used to cleanse the land. The application of cow dung to the soil was believed to neutralize toxins and enhance the land's fertility. And also it highlights the sanctity of cows and their products, which were used in various purification rituals, including those aimed at cleansing the soil.^[08]

Herbal Purification

Use of Medicinal Herbs: The *Yajur Veda* mentions various herbs and plants that were believed to have purifying properties. These herbs were used in rituals to cleanse the soil, particularly in areas where the land was suspected of being contaminated. It underscores the healing and purifying power of herbs, which were used to cleanse both the body and the land.^[09]

Samhita Period

Sushruta Samhita

The *Sushruta Samhita*, offers profound insights into the purification of contaminated soil, particularly in the context of addressing land pollution caused by toxins. The text outlines specific methodologies for neutralizing such environmental contaminants, emphasizing the use of natural agents for purification.

Acharya Susruta says "To get rid of land pollution include usage of sprinkling agents, and decoction agents. *Anantha* (*Hemidesmus indicus*), *sarva gandha*

(*Eladi gana*), *sura*, Cow's milk and *Kali mitti* (black clay) in water are indicated as sprinkling agents.”

Another *yoga* is decoction of *vidanga* (*Embelia ribes*), *paata* (*Cissampelos pareira*), and *kadabhi* (*Albizia procera*).^[10]

Charaka Samhitha

Management of *Janapadhotwamsa*

The living beings affected by environmental toxicity should be managed by *panchakarma* therapy including *vamana*, *virechana*, *astapana vasti*, *anuvastana vasti*, and *nasya* followed by *rasayana* (rejuvenative/immunomodulatory) therapies. For this purpose, drugs should be collected from proper place in proper *kaala*.

The individuals should follow proper regimen and lifestyle as advised under *Sadvritta* (ethical code of conduct) and *Acharya rasayana* (moral, ethical and benevolent conduct which can be roughly termed as behavioral tonic). *Sadvritta* teaches that all human actions aim to bring happiness to all living beings. This happiness is rooted in righteousness and moral conduct, which everyone should consistently practice. Intelligent person desirous of well-being should try best to follow the correct regimen of diet, code of conduct and deeds.^[11]

Vrikshayurveda

Key Techniques for Soil Remediation in *Vrikshayurveda*

Vrikshayurveda, the ancient Indian science of plant life, provides a comprehensive guide to soil management and remediation, essential for sustaining healthy plant growth and ecosystem stability. The traditional knowledge encompasses a detailed approach to preserving soil fertility and addressing contamination and

depletion to maintain agricultural and forestry productivity.^[12]

Enrichment with Organic Matter^[13]

Vrikshayurveda underscores the importance of enhancing soil fertility through the addition of organic matter, such as decomposed plant material and manure, which enriches the soil with essential nutrients and enhances its physical structure, water retention capacity, and microbial activity.

The text suggests cultivating specific plants, such as *Vetiver* (*Vetiveria zizanioides*) and *Kusha* (*Desmostachya bipinnata*), for their effectiveness in stabilizing and restoring soils contaminated with heavy metals and other pollutants.

Application of Herbal Preparations^[14]

Vrikshayurveda recommends using herbal mixtures made from plants like *Haridra* (*Curcuma longa*), *Manjishta* (*Rubia cordifolia*), and *Triphala* (*Terminalia chebula*, *Embllica officinalis*, *Terminalia bellirica*) to detoxify and combat soil pathogens, thereby rejuvenating soil fertility and health.

Crop Rotation and Mixed Cropping^[15]

The practice of crop rotation and mixed cropping, as advised in *Vrikshayurveda*, prevents nutrient depletion and reduces the build-up of pests and diseases, contributing to the natural replenishment of soil fertility.

Irrigation Management^[16]

Vrikshayurveda provides guidance on proper irrigation to maintain optimal soil moisture levels, crucial for healthy plant growth and prevention of waterlogging or soil compaction.

Use of Earthworms and Microbial Inoculants^[17]

Encouraging earthworms and the use of

microbial inoculants derived from cow dung are recommended in *Vrikshayurveda* to enhance soil aeration, nutrient availability, and microbial activity.

Impact and Relevance: The techniques outlined in *Vrikshayurveda* for soil remediation align with modern sustainable agricultural practices and environmental conservation principles, serving as a valuable source of traditional wisdom.

DISCUSSION

The concept of pollution in Ayurveda, refers not only to physical contamination but also to the degradation of land's natural energetic qualities due to unnatural interventions. Ancient Ayurvedic texts documented various causes of land pollution such as improper agricultural practices, deliberate poisoning of land, water, and air by weaker kings to harm enemy armies, misuse of natural resources, and a disruption in the balance of the *Panchamahabhutas* (five great elements: earth, water, fire, air, and space). This ancient understanding aligns with the modern ecological principle of sustainability.

Modern science, on the other hand, categorizes land pollution sources, including agricultural runoff, industrial discharge, and waste disposal, which introduce heavy metals, pesticides, and other pollutants into soil, harming fertility and ecosystems. Remediation often involves high-tech bioremediation and chemical treatments, though these may carry secondary environmental impacts.

Ayurveda offers a sustainable alternative with methods like spraying herbal decoctions to the *Bhoomi*, *Dhupa Karma* (herbal fumigation) and *lepa* (herbal pastes), which improve soil health without harmful chemicals. The Sushruta Samhita

details the application of specific Ayurvedic formulations that help restore the health of polluted soils, reflecting the deep understanding of land care and restoration practiced in ancient times.

Modern studies confirm that these practices can restore microbial activity, increase organic carbon, and reduce heavy metal content, contributing to a balanced ecosystem.

Ultimately, a comparative analysis reveals that integrating Ayurvedic practices with modern remediation techniques could lead to more holistic, eco-friendly land restoration strategies. By merging ancient wisdom with modern practices, particularly in industrially impacted regions, a sustainable and balanced approach to soil health can be achieved.

CONCLUSION

This study emphasizes the need to combine ancient wisdom with present soil clean-up techniques in order to have a long-lasting method of removing soil pollution. Inferred from the experiments is that Ayurvedic cleansing processes might be an essential element in reducing environmental pollution and re-establishing soil health, but further research would be needed to determine their applicability and sustainability on a large-scale and over prolonged periods of other environmental systems as well.

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