

ROLE OF SIDDHA IN ENVIRONMENTAL STRATEGIES.

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ABSTRACT

Ancient India gave much important in cleaning and protection of our environment, as it is linked with the people's behaviour and thoughts. Due to the drastic changes made by industrial development, there is a degradation of natural wealth. Our lives are too polluted just like the environmental pollution and goes on increasing day by day. Enhancement in human health and environmental decline has become a dare today. This can be restrained through the indigenous Siddha medicine which has the basic concept as; man is viewed as a microcosm (*Pindam*) and the universe as a macrocosm (*Andam*). So, any peril to the Mother Nature definitely affects the Human. It taught various deeds in maintaining the homeostasis of the man with the environment for a healthy living in which plants play a prestigious role. This paper deliberately summarizes both air (*Kaatru*) and water (*Neer*) pollutants, and simpler natural methods by plants for prevention as described in literatures, along with the recent scientific evidences proving that Siddha's own plants are boon to human race.

KEY WORDS

Environment, Pollution, Siddha, Plants.

1. INTRODUCTION

In 1800, only 3% of global population lived in urban areas, now its > 50%, and rising. It's about 80% in developed countries ^[1] Environment affects the person's behaviour, body, mind and heart. ^[2] Protection and cleaning up of environment is the essence of ancient Indian culture ^[3]. The phenomenon of man induced global change; the majestic industrial development, the successful Green Revolution, the transport explosion, the rapid growth of cities and hazarded management of natural resources, is a crisis of the complex Earth system. But ancient literatures of, Tamil *Maruthuvam* or Siddha *Maruthuvam* (Medicine) ^[4]

emphasized various deeds and cultures in maintaining the homeostasis of the man with the plant environment for a healthy living. Plants can be used as both bio-monitors and bio-mitigators, to indicate the environmental quality and to ameliorate pollution level^[5]. Our aim of this study is to bring into light, the literatures in Siddha text books related to cleanliness and purification of ecosystem with recent scientific evidence.

2. METHODOLOGY

Studies, reviews or evidences, hypotheses, articles and research paper from Pubmed were studied out and related papers were taken for justification. Siddha literatures were widely studied and briefly discussed in this paper.

3. SIDDHA AND ECOSYSTEM

An ecosystem can be defined as a community made up of living organisms and non living components such as air, water and mineral soil. Humans operate within ecosystems^[6]. Siddha is the art of life which enumerates the medical science, symptoms and its cure & healthiness by creating poise in the delicate life forces (*Uyir thathukkal*) of the total ecosystem of human subsistence in the finest way. Environmental disaster or ecological disaster is a catastrophic event, distinguish from natural disaster is the impact of humans' alteration of the ecosystem has led to widespread and/or long-lasting consequences. It can include the deaths of animals (including humans) and plants, or severe disruption of human life^[7]. But Siddha is the acquaintance of how to exist teaches preventive measures and methods to lead an unpolluted and unwrecked life in the classical literatures *Noi illa Neri* (Siddha Hygiene and preventive Medicine), *Noi naadal Noi mudhal nadal* Part – I, *Pathartha guna chithamani* and *Siddha Maruthuvanga Surukkam*. They are tied up firmly with Tamil cultures and customs. Thus, the conservation of environment formed an ardent article of faith, reflected in the daily lives of the people and also enshrined in myth folklore, art, culture and religion^[3]. By substantial follow of the Siddha literatures concealed with the Tamil cultures our indispensable environs and ecosphere breathe morality and naturalness.

4. AIR POLLUTION

Air pollution occurs when harmful substances are introduced into Earth's atmosphere. It may be indoor or outdoor pollutants.^[8] Urbanites spend 90% of time indoors. City building air-conditioners normally filter out dust (particulates) from incoming air, but don't remove gaseous pollutants. 90% of which comes from fossil fuel combustion; Nitrogen and sulfur oxides, Carbon dioxide (CO₂), carbon monoxide (CO), Air toxics (i.e. volatile organic compounds VOCs^[11]) like Formaldehyde (from particle board, plywood, carpet, curtain, paper

products, tobacco smoke, certain adhesives, and other sources),^[9] Fine particulate matter (PM_{10/2.5}), Ozone.^[1] In outdoor pollution, the air is being continuously polluted, through heavy traffic, industry, domestic fuel combustion, stone quarries, coalmines and various agricultural activities from the adjoining areas. Pollutants include the gases- sulfur dioxide (SO₂), nitrogen oxides (NO) and carbon monoxide (CO), solid or liquid particulates (smaller than 10 µm), and particulate lead.^[10]

4.1. Resolution in Siddha

Siddha Hygiene and Preventive Medicine (Noi illa Neri), explains that every house must have a porch, (or portico). It should be always clean. Herbs like *Tulasi* (Holy basil, *Ocimum sanctum*) or *Malli* (Jasmine, *Jasminum sambac*) should be grown. If a house doesn't have porch then courtyard should be made and basil can be grown. Indoor plants reduce all types of air pollution.

The road linkage between places or village or cities should be planted with these trees like *Alamaram* (Banyan, *Ficus benghalensis*), *Vembu* (Neem, *Azadirachta indica*), *Lluppai* (Honey tree, *Madhuca indica*), *Naval* (Jamun, *Syzygium cumini*), *Ma maram* (Mango Tree, *Mangifera indica*), *Nelli* (Goose berry, *Emblica officinalis*), *Aarasu* (Peepul tree, *Ficus religiosa*), *Asogu* (Ashoka, *Saraca indica*), *Vagai* (Indian walnut, *Albizia lebbek*) on both sides of the pathways. Trees like *Ma maram* (Mango Tree, *Mangifera indica*) and *Kurukkathathi* (Clustered hiptage, *Hiptage benghalensis*) are made to grown in the intersection (juncture of three streets) and squares (juncture of four streets). *Polililgal* (may be parks or garden area) should be made all around; flowering & fruit shrubs and *Thenku - Maram* (coconut tree, *Cocus nucifera*) can be grown to reduce urban outdoor pollution^[11]. The roots of plants anchor the soil particles and trees makes spongy root cover on soil, all together with stem / trunk makes a barrier and prevent erosion. Further, the roots make hair cracks on the land that increase the water table.

4.2. Scientific Facts

4.2.1. Impact of Basil and Jasmine on indoors

Tulsi gives out oxygen for 20 hours and ozone for four hours a day along with the formation of nascent oxygen which absorbs harmful gases like carbon monoxide, carbon dioxide and sulphur dioxide from the environment. Cyclo oxygenate, an enzyme only found in tulsi (Holy basil, *Ocimum sanctum*) was labeled. This enzyme regulates the entire mechanism of oxygen evolution.^[12] It may be also due to a certain kind of photosynthesis

performed by the plant called CAM (Crassulacean Acid Metabolism). These plants have the ability to intake carbon dioxide during night. The fragrance of jasmine (*Malli, Jasminum sambac*) can trigger beta waves in the frontal region of the brain, stimulating alertness,^[13] making humans more observant and intellectual. Formaldehyde removal by herbs, were predominantly indoor ornamentals, when exposed to 2 mL.L formaldehyde in sealed chambers for 1 to 5 h. *Jasminum polyanthum*.Franchet (*Pechi*, Winter jasmine), has got intermediate removal efficiency (1.2 or less to 0.6mg/m⁻³ formaldehyde per cm² of leaf area over 5 h) of formaldehyde.^[9]

4.2.2. Impact of plants on outdoors

In the preliminary survey of dust fall on common roadside, reported that the shape of leaves of Mango (*Ma, Mangifera indica*) etc, trees captured higher amounts of dust as compared to other neighbouring plants.^[10] The plants maintaining high ascorbic acid level even under polluted conditions are considered to be tolerant to air pollution (outdoor), was found to be a maximum of 2.7195 in *Jasminum sambac* (*Malli*, Jasmine), 2.6760 in *Azadirachta indica* (*Vembu*, Neem). The analysis showed that flora; with pH around 7 were tolerant. The pH of the leaf extract was found to be maximum of 7.54 in *Phyllanthus emblica* (*Nelli*, Goose berry), thus under polluted condition may increase their tolerance to air pollution.^[14] Flora with, Air pollution tolerance index (APTI) of plant species (deciduous) *Albizia lebbek* (*Vagai*, Indian walnut) is found to be higher with 32, found to be more tolerant to pollution and can be considered as sink to mitigate pollution.^{[9][10]} Another studies suggests, Many trees like Neem (*Vembu, Azadirachta indica*), /Pipal (*Aarasu, Ficus religiosa*) / Java plum (*Naval, Syzygium cumini*) and several other roadside and street trees have found more suitable in urban environment.^[10]

5. WATER POLLUTION

Water pollution is the, form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies.^[15] Water is used for several purposes by humans but the level of purity of the water being consumed is very crucial since it has a direct effect on health. Safe drinking water should generally be free from heavy metals, turbidity, organic compounds and pathogen.^[16] Magnesium salts, increase hardness of water and gives unpleasant taste. It causes renal failure, respiratory depression and cardiac arrest. Chlorine treated water may affect liver and lead to hepatic damage. So using chemicals is not preferred. As an alternative, biological methods are preferred over chemical methods.^[17]

5.1. Resolution in Siddha

Siddha preventive methods for purification of water can be made possible by filtration followed by boiling so that the unwanted gaseous present there would be evaporated; salts and minerals, microbes and larvae would settle down. Then:

- The seeds of *Strychnos potatorum* (*Thettran*, Clearing nut tree) or wood of *Embelica officinalis* (*Nelli*, Goose berry) is added with the purified water and made to remain still for 5 - 6 hours. The water becomes sweeter, turbidity is removed and purity is obtained.
- Further powdered Alum (*Padikaaram*) of 0.52 grams (4 *kundri*) is added to 1 gallon (3.785 litres) of water, also purifies them but as a daily event, may subsequently cause peptic ulcer.

On the bund of ponds or lakes or rivers; Goose berry tree (*Nelli*, *Embelica officinalis*), Myrobalan (*Kadukkai*, *Terminalia chebula*), Belleric myrobalan (*Thantri*, *Terminalia bellerica*) are grown to keep cool and prevent dryness. These fruits clear up the water source providing sweetness. On the river banks, coconut (*Thenku – Maram*, *Cocos nucifera*) and palm (*Panai*, *Borassus flabellifer*) trees are also grown ^[11]

5.2. Scientific Facts

5.2.1. *Strychnos potatorum* seeds

Studies says, antibacterial activity of *Strychnos potatorum* (*Thettran*, Clearing nut tree) seed crude extract 64 µg concentration, shows/ best zone of inhibition, against *Pseudomonas aeruginosa*(23mm), and better zone of inhibition against *Klebsiella sp.*, (18 mm), *Bacillus subtilis* (14 mm), *Proteus vulgaris* (14 mm), *Escherichia coli* (15 mm), and least was produced against *Staphylococcus aureus* (13 mm), *Staphylococcus epidermidis* (12 mm).^[16] The alcoholic extracts of *Strychnos potatorum* showed antibacterial activity against pathogenic (100 and 200 µg/ml), *Salmonella typhimurium*, *Vibrio cholerae*, *Mycobacterium tuberculosis*, *Aspergillus niger*, and *Candida albicans* were significantly inhibited.^[18]

Direct filtration of a turbid surface water (turbidity 15–25 NTU, heterotrophic bacteria 280 – 500 cfu ml⁻¹, and fecal coliforms 280–500 MPN 100 ml⁻¹), with seeds of *S. potatorum* as coagulant, produced a substantial improvement in its aesthetic and microbiological quality (turbidity 0.3–1.5 NTU, heterotrophic bacteria 5–20 cfu ml⁻¹, and fecal coliforms 5–10 MPN 100 ml⁻¹). To examine reduction of viruses by direct filtration with *S. potatorum* seed as coagulant, 5l of raw water were spiked with poliovirus (grown on a MA-104 cell line and

purified by centrifugation) to produce a challenge level of 2,370,000–5,000,000 plaque-forming units per liter (PFU l⁻¹), and used in the third filter run following backwashing of the filter. Sample of, filtered water (1.5 and 3.5l throughput) were collected and examined for poliovirus, by plaque assay (Smith & Gerba 1982), on an MA-104 cell line. Virus reduction effected was 3 log by *S. potatorum* seed^[19]

Natural coagulant *Strychnos potatorum* treated with Car Wash Wastewater removes: 97% -Turbidity, 54% - Chemical Oxygen Demand, 82% - Phosphorus^[20]. The binding of different transition metals from aqueous solutions by these seeds was studied and the results obtained are Au (I) = 40.80 ppm; Ag (I) = 41.10 ppm; Cu (I) = 38.00 ppm; Zn (II) = 41.70 ppm; Fe (II) = 42.10 ppm, and Fe (III) = 38.20 ppm. On an average the seed binds 0.5 mg of the respective metals per 1.0 g of the seed^[18]

5.2.2. *Phyllanthus emblica* wood

Studies on, *Phyllanthus emblica* (Nelli, Goose berry) wood altered the physicochemical properties: Colour, Odour, Taste, Temperature, pH, Alkalinity, Acidity, Total hardness, Calcium, Magnesium, Chloride, Dissolved oxygen, Biochemical oxygen demand and Chemical oxygen demand of water. Although there is a reduction in microbial load, complete eradication was not achieved by *Phyllanthus emblica* wood. Eradication of organisms could be achieved by boiling the water before and / or after *Phyllanthus emblica* wood treatment^[17]

5.2.3. Alum

Articles say Aluminium sulfate or Alum (*Padikaaram*) is used as a flocculant to remove unwanted colour and turbidity from water supplies^[21]. They are found only to be, effective between pH 6.5 and 7.5^[22]. Studies say, application of potash alum (800mg/L of municipal water) made; Dissolved Oxygen, reduced from 2.9mg/L to 2.1mg/L (alum treated water), free CO₂ values increased up to 77.2mg/L, total hardness decreased from 254mg/L to 248mg/L. Calcium and magnesium hardness reduced from 50.50mg/L to 36.07mg/L and 38.98mg/L to 30.45mg/L respectively. Carbonate values reduced from 22.0mg/L to negligible amount. Bicarbonate from 209 mg/L to 17.0 mg/L, Chloride, increased from 105 mg/L to 133.83mg/L. Salinity increased from 225.38mg/L to 247.0mg/L. Acidity of water, changed from 6.3mg/L to 5.1mg/L. The electrical conductivity, increased from 688 μ S/cm to 1178 μ S/cm. The use of potash alum will cause several potential effects on the health such as:

1. Digestive trouble: Due to this acidity may increase and causes several digestion problems.
2. Inhalation: May cause irritation to respiratory tract if fine particles are breath in when it is

dissolved in water.

3. Ingestion: May cause irritation to gastrointestinal tract like nausea.

4. Skin and eye contact: May cause irritation with symptoms of redness of eye, itching and pains.^[23]

5.2.4. *Borassus flabellifer* (Panai, Palm tree)

Author tells that, most trees spread their roots horizontally. But the roots of Palmyra (*Panai, Borassus flabellifer*) shoot straight downward vertically. Further, their tubular roots store water. This is one of the reasons why our fore fathers, who were good at water management, made it a point to plant and nurture a lot of Palmyra around water bodies like rivers, tanks and wells. Planting these trees help harvest and preserve rain water free of cost. Thus the Palmyra can be described as a slightly long magic wand which in course of time converts an arid place into a water rich land.^[24]

6. DISCUSSION

Environmental pollution in India has increased many fold, one of the greatest problems confronting the modern civilized world is pollution, which literally means fouling the natural habitat and environment.^[25] Proper planning and planting scheme depending upon the magnitude and type of pollution, selection of pollution- tolerant and dust scavenging trees and shrubs should be done for, environmental pollution^[10].

When a building is viewed as ecosystem, it is clear that houseplants can play a vital role in creating a healthy indoor environment^[26]. They, lower indoor particulate levels, absorb noise & buffer noise; lower stress. They have strong capacity to remove VOCs; Main removal agents are normal root-zone bacteria; plant nourishes & regulates its microorganisms (symbiosis)^[1]. Indoor plants add humidity, remove chemical toxins and bio effluents (including carbon dioxide), and suppress airborne microbes. Transpiration also facilitates air flow^[26]. The value of trees in urban environment is now generally recognized not only aesthetically but also functionally in helping to make cities and towns agreeable places to live and work in. By planting trees on both sides, of the roads, pollution can be mitigated. Central verge area should be well utilized by planting dwarf trees and shrubs^[10].

Naturally occurring coagulants are usually presumed safe for human health. The application of plant based coagulants for, drinking water, ground and / waste water treatment, function by means of adsorption mechanism followed by charge neutralization or polymeric bridging effect. Direct filtration with *S.potatorum* seeds as

coagulant appeared effective in clarifying turbid water. This property is attributed due to the presence of polyelectrolyte, proteins, lipids, carbohydrates and alkaloids containing the –COOH and free -OH surface groups in the seed. *Phyllanthus emblica* wood has primary coagulant, shown a high coagulation activity for high-turbidity water. It reduces total hardness, calcium, magnesium and chloride, microbial load. Reduction of magnesium level in water may be due to the chelation property of *Phyllanthus emblica* wood. Microbial load, reduction may be due to biological agents present in the plant and its antimicrobial activity [17].

Alum (*Padikaaram*) has been used since ancient times for this purpose and its use together with filtration is standard practice in conventional water treatment processes around the world. After performing its role the Alum is filtered from the water but a small fraction dissolves and is not removed. A well operated water filtration plant, even using alum as a flocculant, can achieve aluminium concentrations in the finished water of less than 0.1 mg/L [21]. WHO and Water Sanitation and Health (WSH) have described that the proper use of alum requires a skill. Therefore, there is a need to establish a standard value of application of potash alum for common people particularly in the rural areas of India where there is a problem of safe drinking water [23].

The above evidence pursuits that oldest Tamil medicine is a complex esoteric ensemble of practices and is far preponderate. They may be ancient or least and may not contain scientific evidences, but the principles are the, treasure house of secret science, embodying the result of the ordent pursuit thereof by the ancient *Siddhars*. Beneficial characteristic of Palmyra needs to be understood in the context of extreme droughts and erratic rainfall and immediate measures should be taken to its revival [24]. The fact that trees help to absorb and mediate some of the chemicals humans add into the environment, our intricate ties with nature, and of nature's power to impact health and healing. Human DNA actually contains much of the same material found in the plant world, so perhaps that's why living closer to nature can help, to live longer [27] (*As is the microcosm - Pindam, so is the macrocosm - Andam*) [28]. It's time to go back to Nature and to our traditional Tamil cultures in preserving and decontaminating water sources; enhancing standard natural purification methods; planting new saplings and conserving them to cleanse the pollution in human environment and mind.

7. CONCLUSION

This present study is an effort to establish the oldest cultures along with Siddha's view of prevention of habitat pollution by natural means, when followed could definitely improve the harmony of the society.

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