

Azadirachta Indica Leaves as Antibacterial Treatment on Drinking Water

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Abstract The global scenario is now supporting the development of modern drugs from less toxic plant products with proven medicinal properties. Each part of the neem plant (*Azadirachta indica* A. Juss) reportedly has various medicinal properties and has been in use in many continents for centuries. *Azadirachta indica* leaves possessed good anti bacterial activity, confirming the great potential of bioactive compounds and is useful for rationalizing the use of this plant in primary health care. The goal of this work is to treat the drinking water from microbes which cause disease. By using the leaf extract oil it can control upto 99% at different dose and treatment time.

Keywords: antibiotic, bacterial, microbes, plant

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1. Introduction

Medicinal plants have a long history of use and their use is widespread in both developing and developed countries. According to reports of the World Health Organization, 80% of the world's population relies mainly on traditional therapies which involve the use of plant extracts or their active substances [1]. Microorganisms have developed resistance against many antibiotics due to the indiscriminate use of antimicrobial drugs [2]. Furthermore, antibiotics are sometimes associated with side effects [3], whereas there are some advantages of using antimicrobial compounds of medicinal plants, such as fewer side effects, better patient tolerance, relatively less expensive, acceptance due to long history of use and being renewable in nature [4]. It is known that more than 400, 000 spp. of tropical flowering plants have medicinal properties and this has made traditional medicine cheaper than modern medicine [5]. Some plant decoctions are of great value in the treatment of diarrhoea or gastrointestinal disorder, urinary tract infections, skin infections, infertility, wound and cutaneous abscesses [6]. Among them one of most common plant knows to be *Azadirachta indica* or neem. Neem (*Azadirachta indica* A. Juss) is one of the very few trees known in the Indian subcontinent [7]. This tree belonged to *Meliceae* family, and grows rapidly in the tropic and semi-tropic climate. It is also observed that this tree could survive in very dry and arid conditions. The Neem Tree is an incredible plant that has been declared the Tree of the 21st century by the United Nations. Extracts from the Neem tree (*Azadirachta indica* A Juss) also called 'Dogonyaro' in Nigeria are most consistently recommended in ancient medical texts for gastrointestinal upsets, diarrhoea and intestinal infections, skin ulcers and

malaria [8]. All parts of Neem plant such as leaves, bark, flower, fruit, seed and root have advantages in medical treatment and industrial products. Its leaves can be used as drug for diabetes, eczema and reduce fever. Barks of Neem can be used to make toothbrush and the roots has an ability to heal diseases and against insects. The seed of Neem tree has a high concentration of oil. Neem oil is widely used as insecticides, lubricant, drugs for variety of diseases such as diabetes and tuberculosis [9].

The neem tree has been used for more than 4,500 years in the Indian sub- continent. The Indian physicians' charaka (2nd century AD) and susruta (4th century AD), whose books provided the foundation of the Indian system of natural treatment, the Ayurveda, also mention the tree and its medical use [10]. In Ayurveda the neem tree was called the 'Sarva Roga Nivarini' (one that could cure all ailments and ills). At the beginning of this century the neem tree was still highly esteemed by Indian emigrants and they took it along to the places where they settled. Thus, the neem tree was introduced in places like Australia, East and sub- Sahelian Africa, South East Asia, and South America. Pioneering work in the possible commercial use of Neem oil and cake had been done by the Indian Institute of Science in Bangalore as early as the 1920s [11].

Most of the time in rural area people are using the nearby source of water for drinking may that is lake, river, hand pump or well. Due unawareness they drink raw water may that causes infection or diseases [12]. About 1.6 million people die every year from diarrheal diseases (including cholera) attributable to lack of access to safe drinking water and basic sanitation and 90% of these are children under 5, mostly in developing countries [13]. Approximately 150 million people are infected with Schistosomiasis leading to death, approximately 500 million people are at risk of trachoma from which 146

million are threatened by blindness and 6 million are visually impaired [14]. Intestinal Helminthes, Ascariasis, Trichuriasis and Hookworm infection are plaguing the developing countries due to inadequate drinking water with 133 million suffering from high intensity Intestinal Helminthes infections, there are around 1.5 million cases of clinical Hepatitis every year [15]. Even after spending billions of dollar through different region several parts of rural part of world are still deprived of safe drinking water attributing to 90% of rural diseases. Moreover improper maintenance of scheme, inadequate supply of chemicals, unskilled manpower adds to the drinking water related problems. The main goal of the work is to highlight the importance of Azadirachta indica in the application of antibacterial effect on drinking water. The work concentrates on the preparation of oil, optimum dosing of oil and reduction of microbes.

2. Material and Method

2.1. Material

The Azadirachta indica leaves are arranged from university campus. The leaves are dried for 7days or the leaves falls down automatically are collected. It was crush manually with wooden arrangement and make in powder form.

2.2. Method

Extraction of oil was carried out by soxhlet apparatus and it's working on steam distillation process. The powdered leaves of 50 gm were added on 400 ml. of water, the working temperature was maintained at 100°C and distilled for 1 hour. Once the distillation started the sample start boiling within 5 min and vapour are formed. The vapour is cooled down with the help of condensed.

The condensed material was collected on the other side of setup. The collected material is a mixture of oil and water. After the water was separated by the rotary evaporator, the Azadirachta indica oil was purified, and add with ethanol, which used as antibiotic material for drinking water [16].

2.3. Estimation of Microorganism

The original in oculum is diluted in a series of dilutions. Each succeeding dilution will have only one-tenth the numbers of microbial cells as the preceding tube. Then the samples of the dilution samples are used to inoculate (spread plate) the Petri plate on which the colonies grow and can be counted. The water sample containing bacteria (E. coli) are streaked on to the Nutrient Agar medium to check the growth of bacteria. The water sample was used as a control. If there were no colonies on the medium, the results indicate that the Disinfectant is highly effective against the bacteria. All the treatments were carried out in triplicates and the average values were accounted [17].

2.4. Quality Analysis of Extracted Oil

The major test was to know the percentage of chlorophyll, calcium, phosphorus, iron, thiamine, riboflavin, nicotin, vitamin C, carotene, and oxalic acid. Other chemicals that form its therapeutic value are Limonoids, Terpenoids and steroids, Tetranortarpenoids, Fatty acid derivatives like margosinone and margosinolone, Coumarins like scopoletin, dihydrosocoumarins Hydrocarbons like docosane, pentacosane, heptacosane, octacosane etc. Sulphur compounds, Phenolics, Flavonoglycosides, Tannins.

3. Result and Discussion

3.1. Optimization of pH

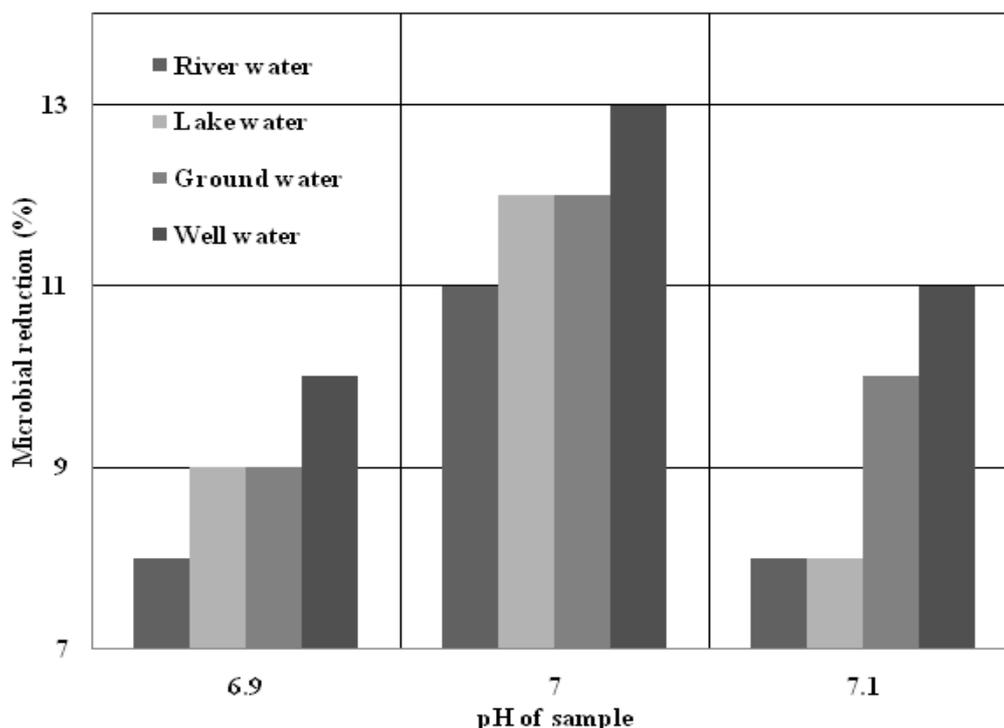


Figure 1. Effect of pH on microbes reduction at 2ml/l dosing, 2hr treatment time

The experiment was carried out at 2hours, 2ml/l dosing and 6.9, 7 and 7.1 pH, which is shown in Figure 1. According to result well water has shown maximum 13% of microbial reduction at pH 7. Lake water and ground show 12% of microbial reduction at same pH. As compared to all three sample river water has less 11% microbial reduction. The reduction was decrease when pH was increase or decrease. PH is one of the important biotic factors that serve as an index for pollution. The factors like photosynthetic exposure to air, disposal of industrial water and domestic sewage effect pH is the value expressed as the negative logarithm of the hydrogen ion concentration [18].

3.2. Optimization of Time

The experiment was carried out at pH 7, dosing 4ml/l and time from 1hour to 12 hours, which is represent in Figure 2. It was observed that the microbial reduction was increase with increase with time. The well water maximum microbial reduction of 97% at 12hr of experiment duration. It was found that at 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11hr microbial reductions 15, 38, 47, 56, 63, 72, 79, 85, 88 and 94%.for the well water. The ground water is little less as compared to well water the reduction

was 94% at 12 hours. At time 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11hours the microbial reduction 13, 26, 35, 44, 54, 61, 69, 76, 83, 88, and 91% for ground water. The lake water shown 90% of microbial at 12hours, it was increase with increase with time. When experimental time was 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11hours the microbial reduction 11, 19, 26, 34, 45, 58, 65, 72, 76, 81 and 87% for lake water. The microbial reduction of river water was only 88% less as compared to all other sample. It may be due to river water required to more time to free itself from microbial reduction. In river generally all type of pollutant are discharge, which make somewhat difficult to remove contaminates present in water [19]. There have been a number of clinical studies showing that Neem has significant effects on several bacterial strains. Among some of the more prominent strains studied were staphylococcus aureus, streptococcus pyogenes, cornebacterium, *E. coli*, and *Salmonella typhosa*. These bacteria's can cause meningitis, cystitis, sore throats, typhoid, blood poisoning, and food poisoning. Neem's ability to exert significant effects over the above mentioned bacterial strains indicates its ability to resolve the aforementioned conditions [20].

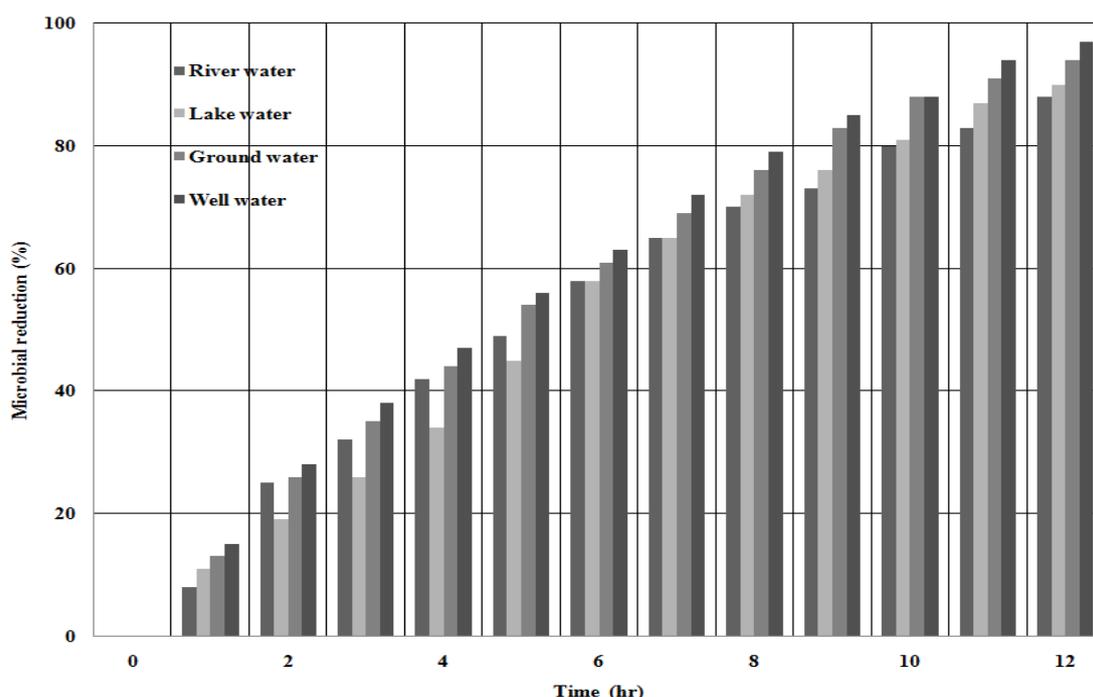


Figure 2. Effect of treatment time on microbes reduction at 4ml/l, pH7

3.3. Optimization of Dose

The experiment was carried out 12 hours at pH 7 and dosing are varies from 1ml/l to 6ml/l, which is shown in Figure 3. The result shows that ground water show maximum 99% of microbial reduction at 5ml/l of dosing. The well water shows 98% of microbial reduction at 4.5ml/l of dosing. The lake water 96% of microbial reduction at 5ml/l of dosing and river water 95% of reduction at 4.5ml/l of dosing. There are certain compounds in Neem that demonstrate a unique ability to surround viruses, which prevents them from causing infection. So depend upon the nature or kind microbes

minimum amount required to stop the growth. Neem also inhibits viral multiplication by interacting with the surface of the cells to prevent the cell from becoming infected by the virus. Neem has been observed to be effective against a number of viral pathogens in various clinical studies demonstrating it contains unique properties to inhibit viral disease. Neem is one of just a few known antiviral agents. Chickenpox, shingles, herpes, and hepatitis are viral conditions, which have been successfully treated, in clinical studies by Neem's therapeutic compounds. The uncomfortable symptoms of colds and flu's can be relieved during seasonal changes by the regular consumption of Neem Leaf capsules, extract, or tea [21,22,23].

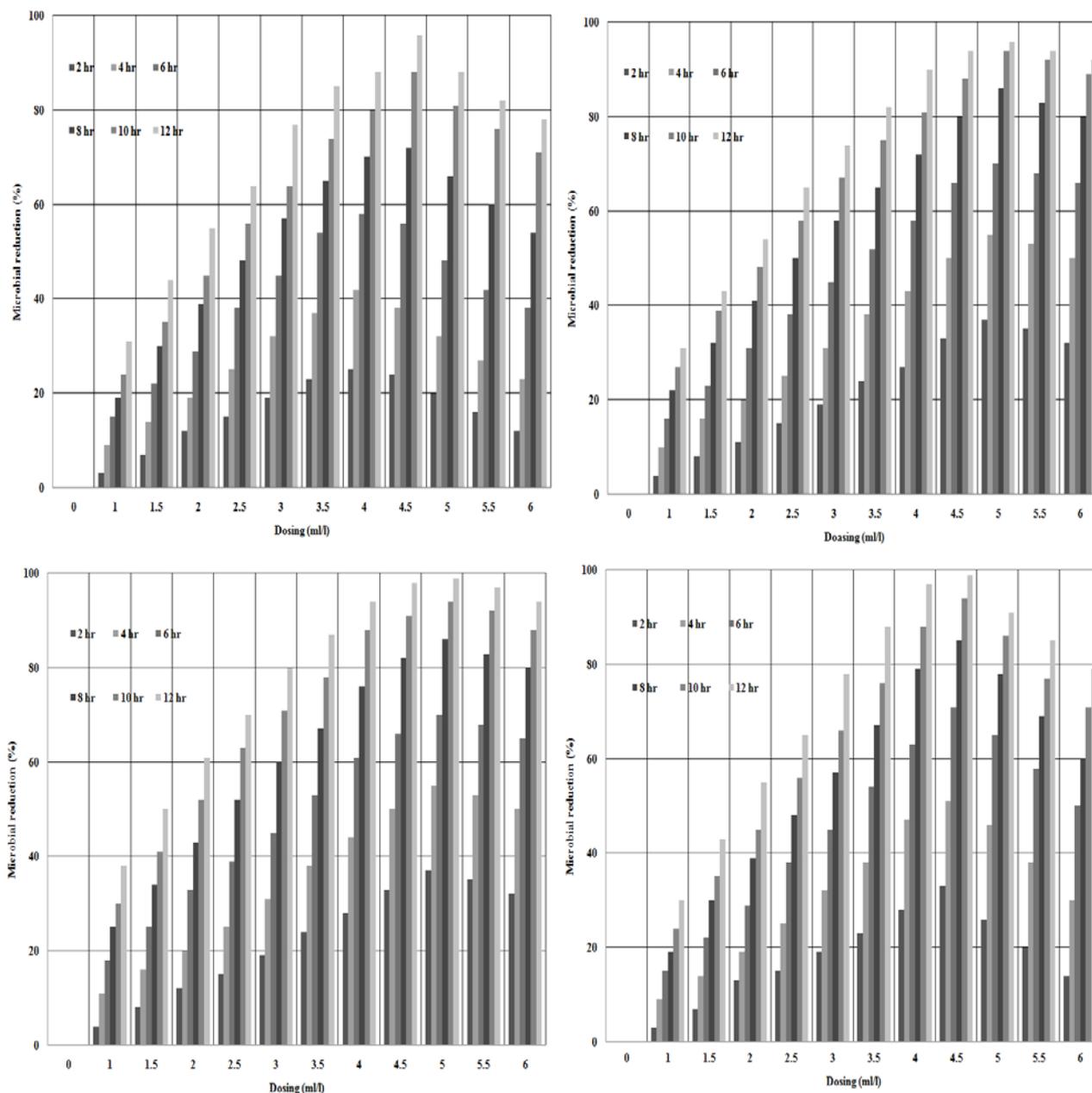


Figure 3. Effect of dosing on microbial reduction at pH7 experimental time 12 hours

4. Conclusion

The *Azadirachta indica* plants leaves have become important in the global context today as it offer solutions to the major concerns of human mankind. This leaves has many application in pharmaceutical, cosmetic, agricultural and food industry. *Azadirachta indica* extracted oil with ethanol shows microbial reduction of 99% ground water, 98% well water, 96% lake and 95% for river water at minimum dose of 5ml/l at 12hours of treatment time. Treatment with *Azadirachta indica* is low cost deal for rural area and efficiency is more as compared to heavy purifier machine.

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