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Antibacterial testing of two culinary medicinal plants from vit nursery

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ABSTRACT

Traditional knowledge and Ayurveda in India is being used since time immemorial to cure dreadful diseases and now has been recognized internationally. Plants are known to have many antimicrobial properties. In India, use of medicinal plants has been known since the Vedic period. The various plants used in the experiment have numerous medicinal properties. Research in this field is highly important because it has various benefits. These include lower incidences of adverse reactions to plant products as compared to pharmaceutical products and lower costs of drugs. The two plants used were Tulsi (*Ocimum sanctum*) and neem (*Azadirachta indica*). The extracts of the two plants were tested against *Staphylococcus aureus*, a gram positive coccal bacteria. Based on a disk diffusion method, the antimicrobial activity of the plants was tested. The zone of inhibition of neem was found to be more than tulsi. This study is thus successful in identifying plants with different antimicrobial activity, so that they can be further exploited for isolation and characterisation to treat various harmful and infectious diseases, especially due to prevalence of drug resistant microbes and the need to produce more effective and lethal microbial agents.

Keywords: culinary, medicinal, traditional knowledge, neem, tulsi

INTRODUCTION

The use of plant products and extracts as drugs can be dated back to as far as the beginning of the human civilisation. {1} According to reports by the World Health Organisation (WHO), nearly 80% of the world's population is dependant on medicinal drugs. In India, use of medicinal properties has been reported since Vedic period {2}. The reasons for this include true improvement of disease conditions after herbal treatment and also the harmful side effects and the high cost of the other forms of treatment. Ayurveda is the foundation of medicinal science in India which deals with the specific properties of drugs. There are nearly 1500 plants that are being used in the various systems of medicine, such as Ayurveda, Unnani and Siddha. The ethno pharmacologists, botanists, microbiologists and natural product chemists are in continuous research for medicinal plants, their efficacy and phytochemicals because the already available data for medicinal plants is comparatively meagre. {1} Drug safety remains to be an enormous global issue. However herbal and medicinal plant products have a comparatively lower incidences of adverse reactions to plant products than conventional pharmaceuticals. Thus, this combined with the reduced costs of drugs is encouraging plant and healthcare institutes to substitute the synthetic drugs with plant medicines. {1} The various medicinal plants used in the experiment have numerous medicinal and antimicrobial properties. Neem is known to have a wide spectrum of biological activity {7}. Neem's importance has been recognized by the US National Academy of Sciences, which published a report in 1992 entitled 'Neem – a tree for solving global problems'. The advancement of neem research has earlier been documented {8,9}. Neem plant (*Azadirachta indica*) from the family Meliaceae is known to cure various ailments of the stomach such as ulcers and worm infestation. It can also cure various skin conditions, head lice, diabetes and various heart diseases. In a recent

study done by some scientists, neem components were used as potential agents for cancer prevention and treatment. The neem components suppress cancer cell proliferation, invasion and angiogenesis{4}. In a study conducted for evaluation of an effective method of sanitization of the root canal systems, it was concluded that neem leaf extract has a significant antimicrobial effect against *E. faecalis* {12}. In another study to evaluate the antiplaque activity of neem leaf extract gel, the results of the study helped to conclude that the dental gel containing neem extract has significantly reduced the plaque index and bacterial count than that of the control group. Thus the study established the use of neem in treating the oral infections by inhibiting the plaque growth as claimed by the traditional medicine{5}.

A study was also conducted to test the antimalarial activity of the neem plant extract. it was found that all the maturation stages of gametocytes were killed by various neem fractions. The anti-plasmodial effect of neem components was observed on parasites. These parasites were however found to be resistant to other anti-malarial drugs, such as chloroquine and pyrimethamine. Neem seed fractions were thus found to be active against the parasite stages responsible for continual malarial transmission and against the parasite stages that cause clinical infection. are thus active not only against the parasite stages that cause the clinical infection but also against the stages responsible for continued malaria transmission{6}. Tulsi (*Ocimum sanctum*) from the family Lamiaceae is the other plant that was used for the experiment. In a study done on the pharmacognosy, medicinal properties and use of the tulsi plant, the anabolic, hypoglycemic, smooth muscle relaxant, cardiac depressant, anti fertility, adaptogenic and immunomodulatory properties of this plant were established. It was reported that the essential oil of Tulsi possessed 100% larvicidal activity against the *Culex* mosquitoes. One of the major constituents of the leaves of this plant, ursolic acid was also reported to possess antifertility activity in rats and mice. This effect was attributed to its antiestrogenic effect, responsible for arrest of spermatogenesis in males and inhibitory effect on implantation of ovum in females. In a study done to test the antidiabetic effects of the tulsi plant, a randomized, placebo-controlled cross-over single blind trial was performed on 40 human volunteers suffering from Type II diabetes. During the four week trial, subjects alternately received a daily dose of 2.5 g of Tulsi leaves powder or a placebo for two week periods. The results showed 17.6 % reduction in fasting blood glucose and 7.3% decline in postprandial blood glucose on treatment with Tulsi as compared to the blood glucose levels during treatment with placebo.

In one study silver nanoparticles were biosynthesized using *Ocimum sanctum* (Tulsi) leaf extract {11}. They found that due to interaction Ag nanoparticles with the bacterial cell wall, the nanoparticle penetrates the bacteria and kills bacterial cell by destroying cell membrane. So this method can be utilized for rapid, cost effective, and ecofriendly way for the synthesis of silver nanoparticles that can be used further in various industrial and medical applications.

MATERIALS AND METHODS

SAMPLE COLLECTION AND PRETREATMENT

Fresh plant samples were collected from the nursery in the VIT, Vellore in Tamil Nadu, India. The fresh plant leaves were sterilised, air dried and then grounded to make a fine thick paste.

The bacterial culture *Staphylococcus aureus* was taken in a solid media from the microbiology lab of Vellore Institute of Technology, Vellore.

PREPARATION OF PLANT AND TURMERIC EXTRACT

The grounded tulsi and neem leaves were mixed with distilled water in a mixer and blended properly. The turmeric powder was mixed with water and blended properly.

The different extracts were stored in plastic test tubes.

ANTIBIOTIC TESTING

Antibacterial activity of the aqueous extracts of neem, tulsi and turmeric were determined by the disc diffusion method. A fresh culture of *Staphylococcus aureus* was prepared using 0.6g of nutrient broth in 100mL of distilled water. This freshly prepared culture was used to inoculate Mueller Hinton agar that had been prepared by adding 3.8g of HA and 1.8g of bacterial grade agar. 100 mL of the sterile Mueller Hinton agar had been distributed among four petri plates. The disks were impregnated with the extract and dried before placing it on the culture. In each petri plate a blank disk impregnated with water was put as control. The microbial organism was cultured overnight at 37°C in an incubator.

RESULTS AND DISCUSSION



Scale 1:3 in cm

Zone of inhibition:

Neem = 0.5 units(1.5 cm)

Tulsi =0.3 units(0.9 cm)

The medicinal properties of the plants is due to a combination secondary metabolites in the plants. It can be attributed to this combination of medicinal plants. The combination of metabolites is distinct for every plant {6}. The aim of this study was to investigate those plants that have been particularly helpful as traditional medicine, to improve healthcare. Plant extracts are useful as potential sources of antimicrobial compounds against bacterial pathogens. In Vitro studies have effectively shown that plant extracts inhibit bacterial growth, although effectiveness varies {1}. The antimicrobial activity of plants has also been reviewed earlier by Zaika(1998), and classified as weak, strong or medium. The plants selected for this study showed high antimicrobial effects against the bacteria *S.aureus*. It was observed that neem had a higher zone of inhibition than tulsi, and these results are similar to those obtained in other studies where similar plants were tested for their antimicrobial activity against *S.aureus*.{1} The chemical composition of tulsi contains many nutrients and other biologically active compounds, thus making it highly complex. The proportion of the compounds between the strains varies considerably{11}. It was also found in a study that the variations of growing, harvesting, processing and storage conditions may affect the constituents{13}. The alkaloids, glycosides, flavonoids and saponins are the antibiotic principles of neem plants. These antibiotic principles are actually the defensive mechanisms of neem against pathogens {14}.

CONCLUSION

Many of the existing synthetic drugs cause various side effects. Hence, developing plant based compounds would be useful in meeting this demand for newer drugs with minimal side effects. Thus new research look forward to natural products like neem and tulsi plants for production of antibacterial drugs. Now the time has come to make good use of centuries-old knowledge on these traditional plants through modern approaches of drug development which leads to their better economic and therapeutic utilization so that it benefits the society.

A. indica leaves possessed good antibacterial activity confirming the great potential of bioactive compounds and is useful for rationalizing the use of this plant in primary health care. Several therapeutically and industrially useful preparations and compounds of neem have also been marketed. The extract of *A.indica* when used as medicinal plant, could be useful for the growth inhibition of the carcinogenic bacterium.

Even tulsi showed good antibacterial activity proving that these plants can be used for manufacturing new and effective drugs. However, further work is needed to locate the active principle from the various extracts and their pharmaceutical studies should be conducted..

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