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COMPARATIVE STUDY ON THE ANTIBACTERIAL ACTIVITY OF SOME MEDICINAL PLANTS

Maskare Rina*, Indurwade Nitin, Sonwane Pallavi, Badole Payal

Manoharbhay Patel Institute of Pharmacy, Tiroda Road, Gondia District, Kudwa, Maharashtra 441614, Gondia, India.

ABSTRACT

In the present scenario, resistance of pathogenic microorganisms to the most of antimicrobial agents is increasing. In this study we have compared the antimicrobial effect of some medicinal plants like Neem, Clove, Turmeric and Garlic. The methanol extracts of these plants were prepared. Then comparative analysis of antibacterial effects between those extracts were tested in *S aureus* and *Escherichia coli* culture. The antibacterial activity was investigated using well diffusion method. All of the leaf extracts have shown antibacterial activity. The antibacterial activity of methanol extract of Neem leaves and Turmeric rhizome are active against *S. aureus* and *E.coli* respectively.

Key words: Antibacterial effect, multidrug resistance, pathogenic microbes, synergistic effect.

INTRODUCTION

One of the most powerful and successful achievements of modern science and technology for the control of microbial infections lie in the discovery and development of antibiotics. Antibiotics are sometimes associated with adverse side effects also, such as immunosuppression and allergic reactions [1]. However, resistance of pathogenic microorganisms to the existing antimicrobial agents is increasing with an alarming frequency [2]. The number of multidrug resistant microbial strains with reduced sensitivity to antibiotics is continuously increasing. This increase has been attributed to the use of broad-spectrum antibiotics [3]. There is an urgent need to control antimicrobial resistance by identifying novel antibiotic agents with improved efficacies. Moreover, the development of new antibiotics from plant sources should be encouraged as they are of primary importance to maintain the effectiveness of antimicrobial treatment (lab ref.). The potential for developing antimicrobials from higher plants appears rewarding, as it will lead to the development of phytomedicines to act against various microbes. Historically, plants have provided a source of active principles for novel drug compounds, and act as repositories for modern medicine. Though, the scientific validation of antimicrobial properties of plant components were first documented in the late 19th century [4], but

today, they have provided the models for 50% Western drugs [5]. Many commercially proven drugs used in modern medicine were initially used in a crude form in traditional or folk healing practices. Plant derived medicines are cost effective and relatively safer, being less toxic over synthetic drugs. Hence, exploration of plant derived antimicrobial agents is the need of the hour as plants still hold their own unique place, by the way of having no side effects.

Medicinal plants are very important to human beings in preserving our health [6]. The use of antibiotics to control diseases produces adverse toxicity to the host organs, tissues and cells. The toxicity produced by the antimicrobial agents can be prevented by using herbs. Neem, garlic, turmeric and clove are being used in traditional medicine. The aim of the study was to carry out a comparative study on the antibacterial activities of the ethanolic extracts of part of these plants.

MATERIALS AND METHOD

Strains used

- *Staphylococcus aureus* ATCC 6538
- *Escherichia coli* ATCC 8739

Nutrient Agar Medium

Beef extract - 0.3gm

Yeast extract - 0.2gm
Sodium chloride - 0.3gm
Peptone - 0.5gm
Agar agar - 1.5gm
Distilled water - 100ml
pH - 7.0

Chemicals used

Methanol

Collection of parts medicinal plants

Garlic, clove and turmeric were collected from local market. The medicinal plants selected for the present study was collected from in and around Gondia district, Maharashtra, India. The collected Neem leaves of the plants were shadow dried in room temperature.

Extraction

The active component from the plants was extracted in a stepwise manner as mentioned. Grinding of Neem leaves, Turmeric rhizomes, clove buds and garlic bulb of plant into very small units ranging from larger course fragments to fine powder. Grinding was employed in the production of initial phases of plant extracts. Grinding or mincing of the leaves was carried out in a mixer. The fine powder obtained after grinding was used

for extraction and the fine powered was stored under good condition to reduce the risk of the contamination.

Methanolic extract

Methanolic extracts of the plants were prepared by mixing 4 g of medicinal plant powder with 50 ml of 80% methanol and 20% distilled water in an airtight conical flask and kept at room temperature overnight. After 12 hours of extraction, the solution was filtered using muslin cloth and the filtrate was kept at room temperature for evaporation of methanol. The solution was filtered to get the concentrated extract [7, 8].

Antibacterial activity by well diffusion method

The antibacterial activity of the different plant extracts was evaluated by Agar well diffusion method. Sterile nutrient plates were prepared. The plates were allowed to solidify for 5 minutes and wells of 6 mm were punctured using a well borer. 0.1% inoculum suspension of *Staphylococcus aureus* (ATCC 6538) and *Escherichia coli* (ATCC 8739) were swabbed uniformly over the surface of the agar. 20 μ l of each herbal extract was loaded into the well and the plates were kept for incubation at 37°C for 24 hours. The antibacterial activity was evaluated in terms of zone of inhibition, measured and recorded in millimeters.

Fig 1. Comparative study of Zone of inhibition between herbal extracts

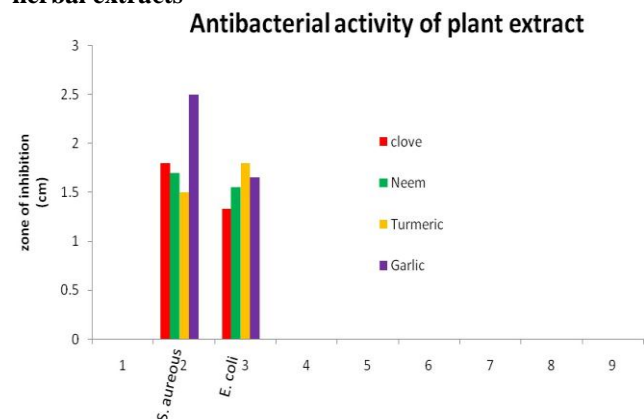


Fig 2. Comparative study of Zone of inhibition between herbal extracts against S. aureus and E. coli

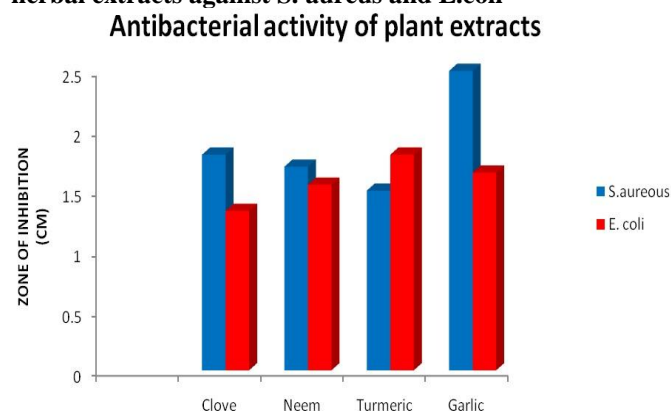


Fig 3. Specification of microbes on various agar plates: S.aureus

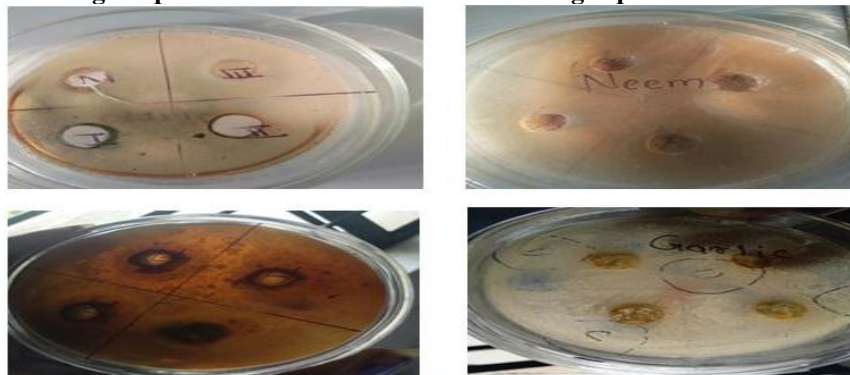


Fig 4. Specification of microbes on various agar plates: E.coli

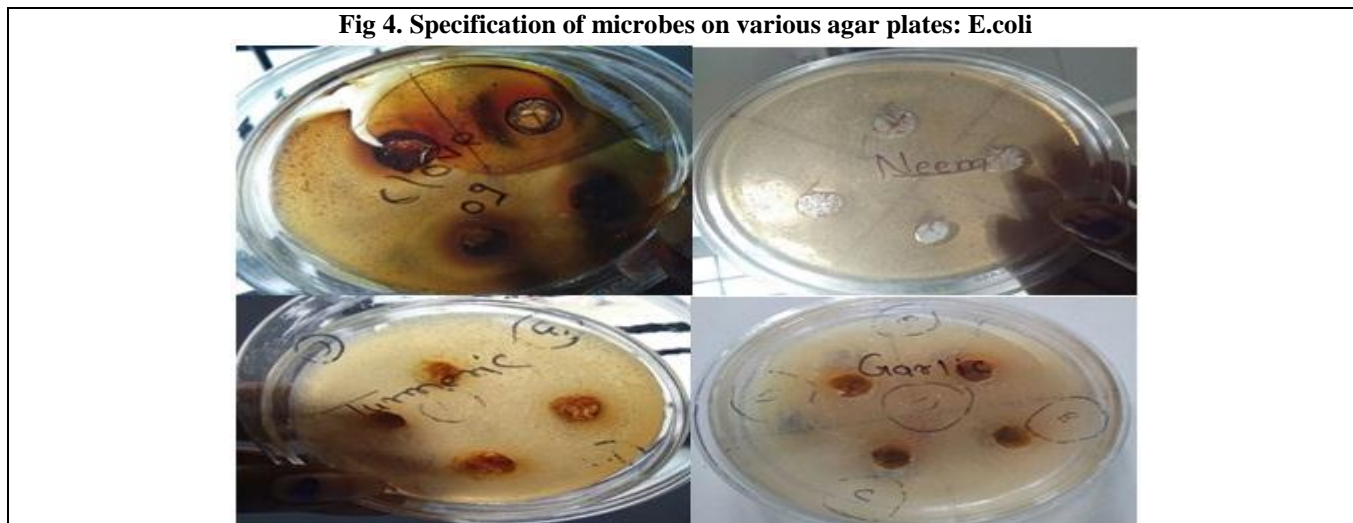


Table 1. Comparative study of Zone of inhibition between herbal extracts

Herbal extracts applied (Methanolic)	Zone of clearance in cm (S. aureus)	Zone of clearance in cm (E.coli)
Names		
Clove	1.8	1.33
Neem	1.7	1.55
Turmeric	1.5	1.8
Garlic	2.5	1.65

RESULTS AND DISCUSSION

The results of antibacterial activities of the ethanolic extracts of the leaves of Neem, Garlic Bulb, Clove Bud and Turmeric Rhizome are given in Table 1. The results indicated that the ethanolic extract of garlic exhibited more antibacterial activity against *S. aureus*, while the methanolic extract of turmeric rhizome showed antibacterial activity against *E.coli*. This shows that the ethanolic extracts of neem leaves and turmeric rhizome are active against *S. aureus* and *E.coli*. These extracts can act synergistically against *Staphylococcus aureus* and *E.coli* when combined together. The result showed that the extracts were very active antibacterial.

CONCLUSION

In conclusion, the ethanolic extracts of the leaves of Neem and Turmeric rhizome offer potential antibacterial property against *Staphylococcus aureus* and *E.coli* respectively. The results of antibacterial activity of the extracts suggests the combination of the two extracts for traditional medicine for synergism. There could be more activity of the extracts as a result of the combination.

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CONFLICT OF INTEREST

No interest

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