

To Evaluate the Combined Antibacterial Activity of Garlic, Ginger and Papaya

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Abstract: The study was conducted to evaluate the combined antibacterial effect of Garlic, Ginger and Papaya. The leaves of Papaya, rhizomes of ginger and bulbs of ginger were dried and finely powdered. The ethanolic extracts were prepared for each herbs individually and were screened for their individual as well as combined antibacterial property. For antibacterial activity the plant extract shows good antimicrobial activity against test pathogens i.e gram negative bacteria (*E.coli* and *P.aeruginosa*) and gram positive bacteria (*S.aureus* and *B.cereus*). All extracts show good antimicrobial activity against Gram-positive bacteria while showing poor activity against Gram-negative bacteria

Keywords: Antibacterial Effect

I. INTRODUCTION

Just as evaluation of biological activity is essential for the assessment of susceptibility to antibiotics, it is also necessary for screening new antimicrobials [7]. Natural products, either pure compounds or standardized plant extracts provide unlimited opportunities for novel and suitable additives and drug treatments because of their unmatched range of chemical diversity. Several methods are currently available to detect their antimicrobial activity and since not all of them are based on the same principles, the results obtained are influenced not only by the method selected, but also by the microorganisms used, and by the extraction method or the degree of solubility of each test-compound [7]. Since ancient times, natural products have been used for the treatment of several infectious diseases. These products including medicinal plant extract are promising sources for the development of novel therapies against diseases [8]. The extract of papaya (Caricaceae), ginger (Zingiberaceae) and garlic (Liliaceae) which are used for medicinal purposes due to its Antibiotic and Anthelmintic properties [8]. It is also reported to have antioxidant activity [8]. The present study aimed to evaluate the anthelmintic and the antimicrobial activities of herbs against the earth worm *pheretima posthuma*, and gram-positive and gram-negative bacteria [8].

II. MATERIALS AND EQUIPMENTS

2.1 List of Drugs

Drug and materials used in dissertation work is listed in Table along with their supplier.

Table: List of drugs used in dissertation work

Sr. No.	Drugs	Supplier
1	Papaya leaves	Kolhapur Locality
2	Garlic bulbs	Kolhapur Locality
3	Ginger rhizomes	Kolhapur Locality
4	Ethanol	LOBA Chemie, India
5	Agar	LOBA Chemie, India
6	Streptomycin	LOBA Chemie, India

2.2 List of Equipments

Equipments used in dissertation work is listed in Table along with their manufacturers.

Table: List of equipments used in dissertation work

Sr. No.	Equipments	Manufacturer
1	Digital weighing balance	CONTECH, India
2	Hot air oven	COSLAB, India
3	Soxhlet apparatus	J-SIL, India

2.3 List of Materials

Materials used in dissertation work is listed in Table along with their manufacturers.

Table: List of materials used in dissertation work

Sr no.	Materials	Manufacturer
1	Whatman filter paper no.1	Paper distributor, India
2	Conical flasks	Garg Process Glass, India
3	Beakers	J-SIL, India
4	Petri dish	Pioneer Impex, India
5	Rotary Evaporator	SHIMADZU
6	Autoclave	ACCUMAX INDIA

2.4 List of Bacteria

Bacterias used in dissertation work is listed in table no along with their supplier

Table: List of bacterias used in dissertation work

Sr. No.	Type of Bacteria	Name of Bacteria	Supplier
1	Gram-Positive	Staphylococcus aureus	Shivaji University
2	Gram-Positive	Bacillus cereus	Shivaji University
3	Gram-Negative	Escherichia coli	Shivaji University
4	Gram-Negative	Pseudomonas aeruginosa	Shivaji University

2.5 Drug and excipient profile:

Zingiber officinale

Taxonomy[10] - Kingdom : Plantae Division: Magnoliophyta Order : Zingiberales Family : Zingiberaceae Genus : Zingiber

Species : *Z officinale*

Z officinale is a tropical plant and highly adapted to grow in sub-tropical areas also. *Z. officinale* grows well in warm and humid conditions .[10] The plant is cultivated in China, Nepal, US,India, Bangladesh, Taiwan, Jamaica, Nigeria and some other parts of world, India is the biggest producer of *Z. officinale* in the world. In India, it is been cultivated in almost all the states.[10]

Synonyms [10] –

Zingiber

Rhizoma Zingiberis

Allium sativum

Taxonomy –

Kingdom : Plantae Division: Angiospermae Order: Liliales

Family: Alliaceae Genus: Allium Species: sativum

The plant is native to Central Asia but grows while in Italy and Southern France & is a classic ingredient in many national cuisines [29].

Synonyms [29]-

Allium arenarium Sadler ex Rchb. 1830 not L. 1753
Allium controversum Schrad. Ex Wild

***Carica papaya* Taxonomy[9]**

Kingdom:Plantae
Division:Magniliophyta
Order:Brassicales
Genus:Carica
Species : Carica Papaya Linn

Carica papaya Linn (caricaceae) is a large, single-stemmed herbaceous perennial tree cultivated all over the world, contains many biologically active compounds like papain and chymopapain[9]

Synonyms[9]

Papaia Pawpaw

III. EXPERIMENTAL WORK

Material and methods

In vitro antimicrobial studies:

Collection of Plant Materials

Fresh and healthy parts of Garlic (bulbs),Ginger (rhizomes) and papaya(leaves)were collected from locality of Kolhapur, India [10].

After collection, the plant parts i.e., bulbs, rhizomes and leaves werewashed with distilled water [10].

Papaya leaves and ginger rhizomes were sun dried for 4-6 days and garlic bulbswere dried using hot air oven for 2-3 hours at 50-100 ° C [10].

Chemicals:

All media components and chemicals required for antimicrobial activity were purchasedfrom Hi-Media India.

Preparation of samples:

Test samples are obtained by using a Soxhlet extractor in absolute ethanol and obtained extract is concentrated by using a rotary evaporator. After that,100 µl concentrations of respective test samples were examined for their antimicrobial activity.

Preparation of the nutrient medium:

Nutrient agar medium was prepared by dissolving 2.8g of nutrient agar in 100ml distilled water. The solution was sterilized in an autoclave at 121°C (1.1N pressure) for 15 min. The suspension was cooled and poured into sterile Petri-dishes to solidify. The agar depth of the medium was 4.0mm[13].

Antimicrobial studies:

The agar well diffusion method was used to test the antibacterial potential of plant extract against Gram-positive (*Staphylococcus aureus* NCIM 2654, *Bacillus cereus* NCIM 5433) and Gram-negative (*E. coli* NCIM 2832, *P. aeruginosa* NCIM 2200) bacterial pathogens with slight modifications [11].

For further study, the respective test pathogen suspension was prepared in sterile saline then pathogens were spread on the surface of nutrient agar plates using a sterile spreader for the antimicrobial activity test.[11]. After that, an agar well was created using a 0.7 cm diameter sterilized cork borer.[11].

Then about 100 µl of the concentrated test samples of respective plant extract was loadedin the wells prepared on the agar plates.[11]

Plates were placed at 4 °C for 10 min for sample diffusion in a culture medium andtransferred to an incubator at 37 °C for 24 h.[11]

Furthermore, the obtained results were compared with the standard antibiotic for that 100µg/ml Streptomycin used as the positive control and ethanol as a negative control.[11]

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The diameter of the inhibition zone was measured in mm and the results were recorded [11].

IV. RESULTS AND DISCUSSION

Obtained results state that the plant extract shows good antimicrobial activity against test pathogens. All extracts show good antimicrobial activity against Gram-positive bacteria while showing poor activity against Gram-negative bacteria.

Table: Antimicrobial activity of plant extract against respective test pathogens in mm

Sr.No	Test organisms	Zone of inhibition of respective compounds in mm					
		Garlic	Papaya	Ginger	Combination	Ethanol	Streptomycin
1.	<i>S.aureus</i>	12	13	12	16	00	23
2.	<i>B.cerues</i>	11	10	12	20	00	24
3.	<i>E.coli</i>	00	11	00	18	00	22
4.	<i>P. aeruginosa</i>	10	00	14	17	00	26

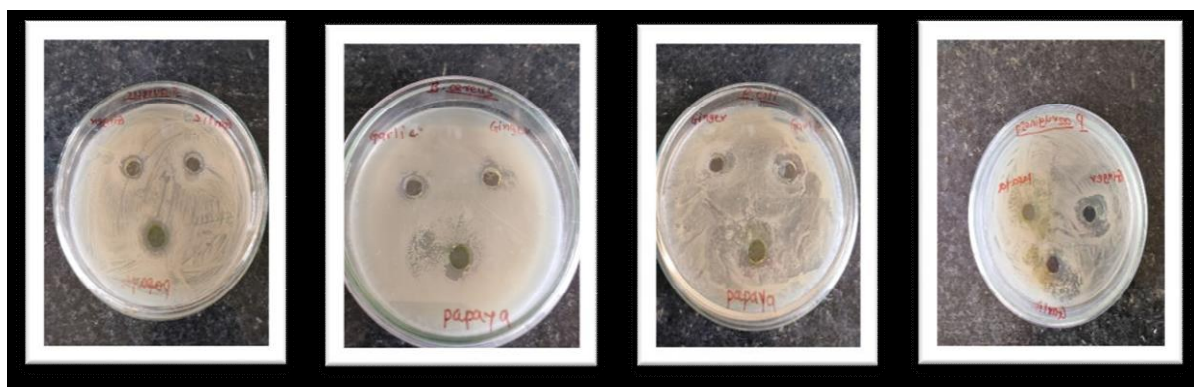


Fig- Antibacterial activity of individual herb extract

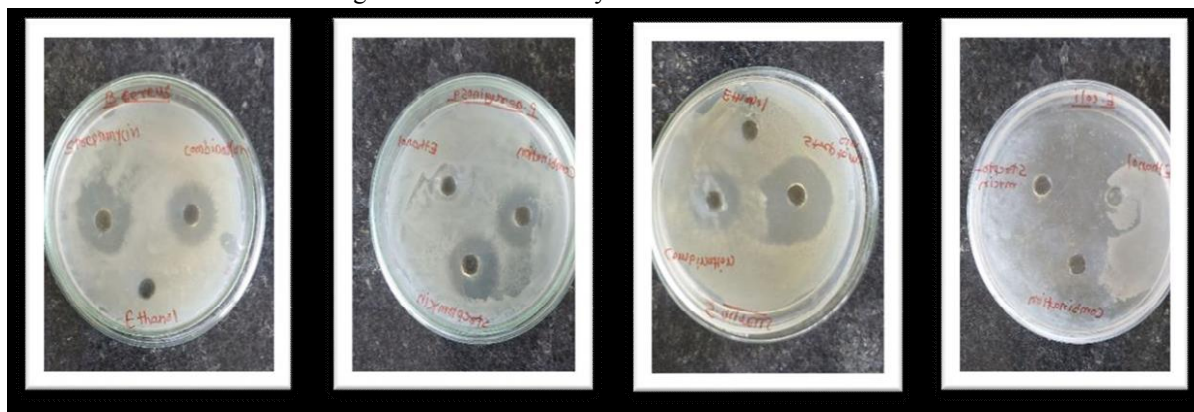


Fig- Antibacterial activity of individual herb extract

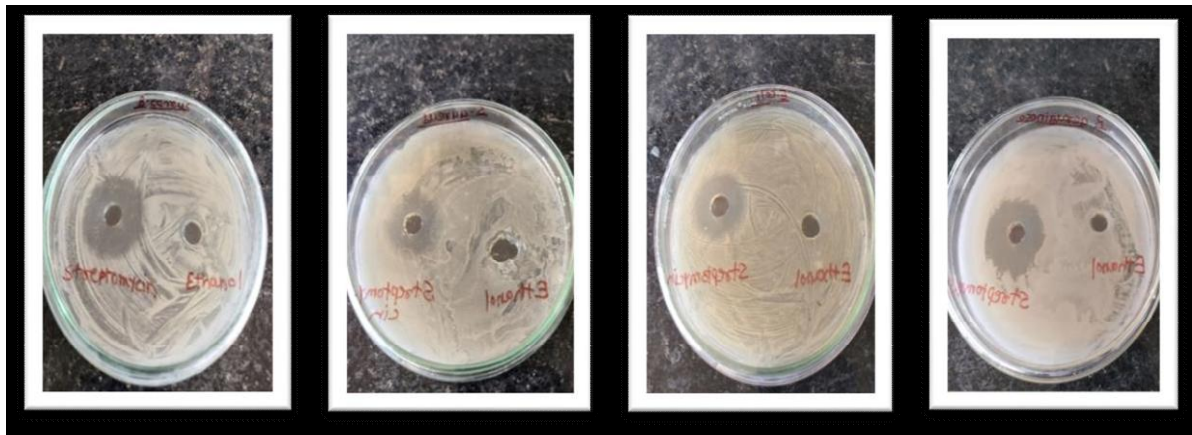
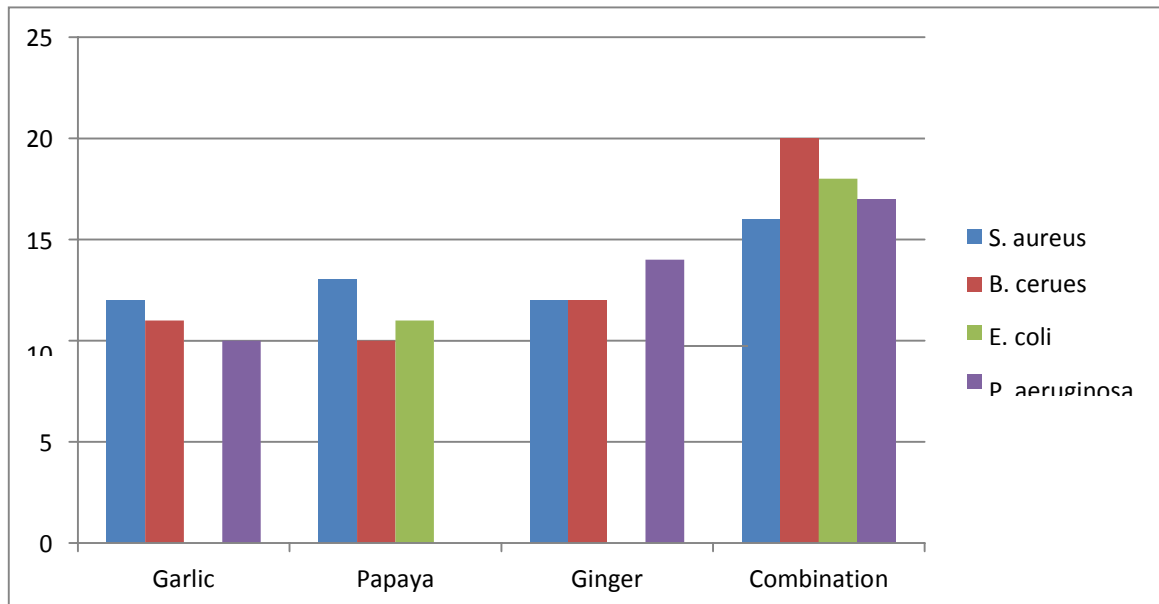


Fig- Antibacterial activity of individual herb extracts

Chart:- Antimicrobial Activity of plant extract against respective pathogens in mm [zone of inhibition in mm (x-axis) v/s (y-axis)]



V. CONCLUSION

In this study, combination of ethanolic extract of Papaya ,Garlic and Ginger exhibited synergistic antimicrobial activity against gram-positive bacteria (S.aures & B.ceceus) and gram negative bacteria (E.coli & P aeruginosa). Our results showed that papaya ,ginger and garlic are an effective antibacterial agents