ANTIBACTERIAL EFFECT ON VARIOUS HOME REMEDIES ON DIFFERENT STRAINS OF BACTERIA

Project work by

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Degree of Bachelor ofScience in Zoology

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CERTIFICATE

This is to certify that the project report entitled **"ANTIBACTERIAL EFFECT OF VARIOUS HOME REMEDIES ON DIFFERENT STRAINS OF BACTERIA"** submitted by Ms. Aleena Roy, Reg No: AB20ZOO027 in partial fulfilment of the requirement of Bachelor of Science degree of Mahatma Gandhi University, Kottayam, is a bonafide work under my guidance and supervision and to my best knowledge, this is her original effort.

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1)

2)

DECLARATION

I, hereby declare that this project work entitled **"ANTIBACTERIAL EFFECT OF VARIOUS HOME REMEDIES ON DIFFERENT STRAINS OF BACTERIA"**is submitted to St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam in partial fulfilment of the requirementof Bachelor of Science degree in Zoology. This work has not been undertaken or submitted elsewhere in connection with any other academic course and the opinions furnished in this report are entirely my own.

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SYNOPSIS

Several house hold products have been widely used as remedies of certain diseases due to its anti- inflammatory, anti-bacterial, anti-fungal, anti-viral and anti-oxidant properties. The present project "**ANTIBACTERIAL EFFECT OF VARIOUS HOME REMEDIES ON DIFFERENT STRAINS OF BACTERIA"** was focused to find the anti-bacterial activity of seven home remedies such as *Allium sativum* (Garlic), *Allium cepa* (Onion), *Zingiber officinale*(Ginger), *Citrus limon* (Lemon), *Curcuma longa* (Turmeric), *Aloe vera* (Aloe)and *Phyllanthus emblica* (Amla).

Antibacterial agents are a group of substances produced by microorganisms that can inhibit or suppress the growth of other microorganisms. They are widely used in antibiotic medications for the treatment and prevention of diseases.

This study shows the effectiveness of various home remedies against six different strains of bacteria, of which three of them were gram positive including *Staphylococcus aureus*, *Enterococcus faecalis*, *Mycobacterium* and three of them were gram negative including *Escherichia coli*, *Klebsiella pneumonia* and *Vibrio parahaemolyticus*.The method used was Kirby Bauer's disc diffusion method. With this project, it concludes that *Citrus limon* shows the highest antibacterial activity against*Escherichia coli* with a zone of inhibition of 3.2 cm, while all other samples exhibited only least effect against the six strains of bacteria taken.

INTRODUCTION

Antibiotics are commonly used in the treatment of bacterial infections. But because of abuse and incorrect usage, today many bacteria have become resistant to these drugs. Moreover, many antibiotics also come with side-effects that can sometimes damage organs like the liver and kidneys. Therefore, many people today look for natural alternatives to these drugs. Luckily, there are many home remedies and foods that work as natural antibiotics. So, instead of going for medications, it is better to add these foods todaily diet to be safe from many bacterial infections. These can not only prevent bacterial infections but also help us fight the invading pathogens if we are already infected. These natural antibiotics will bring down inflammation and increase the presence of good, protective bacteria. Treating common ailments with ingredients available in the home is known as home remedies. Many of the remedies are having years of history, which might have developed by trial and error method and passed through generations. In this project seven commonly used itemssuch as ginger, amla, lime, garlic, turmeric, onion and aloe vera are reviewedto evaluate it's scientific basis in usage as home remedies.

The allium compound in garlic kills both gram-positive and gram-negative bacteria and is effective in treating intestinal infections causing diarrhoea. Gingerol, terpenoids, shogaol, zerumbone and zingerone as well as powerful flavonoids present in ginger shows anti-microbial properties.Rich source of therapeutic sulfur compounds called cysteine sulphoxides in onion have amazing antibiotic effects. All are proved to be effective in the treatment of the specific condition which acts by the virtue of its specific active ingredients in the drugs.

Bacterial strains used in the experiment

- **Gram negative bacteria**

  1. *Klebsiella pneumonia*
  2. *Vibrio parahaemolyticus*
  3. *Escherichia coli*

- **Gram positive bacteria**

  1.*Staphylococcus aureus*
  2. *Enterococcus faecalis*
  3. *Mycobacterium*

BACTERIAL STRAINS	DESCRIPTION
Klebsiella pneumoniae	*Klebsiella pneumoniae* is a gram negative, non-motile lactose fermenting bacteria that can grow with or without free oxygen, making it a facultative anaerobe. It is also surrounded by a capsule which increases its virulence by acting as a physical barrier to evade host immune response. It can be found in the mouth, skin and gastrointestinal tract where it is of the normal flora. Infection of *Klebsiella pneumoniae*occurs in the lungs where they cause necrosis, inflammation and hemorrhage within the lung tissue.
Vibrio parahaemolyticus	*Vibrio parahaemolyticus* a curved, rod-shaped, Gram-negative bacterium found in the sea and in estuaries which, when ingested, may cause gastrointestinal illness in humans. *V. parahaemolyticus* is oxidase positive, facultatively aerobic, and does not form spores. Infection can occur by the fecal-oral route, ingestion of bacteria in raw or undercooked seafood, usually oysters, is the predominant cause of the acute gastroenteritis caused by *V. parahaemolyticus*. Wound infections also occur, but are less common than seafood-borne disease.
Escherichia coli	*E.coli* is a gram negative, facultatively anaerobic, rod-shaped, coliform bacterium, commonly found in the lower intestine of warm blooded organisms. Most of the *E. coli* strains are harmless, but some serotypes can cause serious food poisoning in their hosts, and are occasionally responsible for product recalls due to food contamination. The harmless strains are part of normal flora of gut, and can benefit their hosts by producing vitamin K2 and preventing colonization of the intestine with pathogenic bacteria.
Staphylococcus aureus	*Staphylococcus aureus* is a gram positive round shaped bacterium that is a member of the Firmicutes, and it is a usual member of microbiota of the body, frequently found in the upper respiratory tract and on the skin. It is often positive for catalyse and nitrate reduction and is a facultative anaerobe that can grow without the need for oxygen. It is an opportunistic pathogen, being a common cause of skin infections including abscesses, respiratory infections, such as sinusitis and food poisoning.
Enterococccus faecalis	*Enterococci* are gram positive cocci bacteria that can survive harsh conditions in nature. They can be found in soil, water and plants. Some strains are used in manufacture of foodstuffs whereas others are cause of serious animal and human infections. They are associated with both community and human acquired infections. These infections may be local or systemic and include urinary tract and abdominal infections, wounds infections, bacteraemia and endocarditis.
Mycobacterium	*Mycobacterium tuberculosis,* also known as Koch's bacillus, is a species of pathogenic bacteria in the family Mycobacteriaceae and the causative agent of tuberculosis*M. tuberculosis* has an unusual, waxy coating on its cell surface primarily due to the presence of mycolic acid. This coating makes the cells impervious to Gram staining, and as a result, M. tuberculosis can appear weakly Gram-positive.

REVIEW OF LITERATURE

Bacteria are single celled microbes. The cell structure is simpler than that of other organisms as there is no nucleus or membrane bound organelles.*E-coli* is gram negative, facultatively anaerobic, rod shaped bacterium that is commonly found in the lower intestine of warm blooded organisms. *Staphylococcus aureus* is a gram positive coccal bacterium that is a member of the Firmicutes, and is frequently found in the human respiratory tract. *Klebsiella pneumoniae*, a rod shaped bacterium and common gut bacteria, causes problems when it moves outside the gut and causes infection. *Vibrio parahaemolyticus* is a curved, rod-shaped, Gram-negative bacterium found in the sea and in estuaries which, when ingested, may cause gastrointestinal illness in humans. *Mycobacterium tuberculosis,* also known as Koch's bacillus, is a species of pathogenic bacteria in the family *Mycobacteriaceae* and the causative agent of tuberculosis. *Enterococcusfaecalis* is a gram positive commensal bacterium inhabiting the anointestinal tracts of humans and other mammals.

Antibacterial Effects of Aloe Vera Extracts on some Human and Animal Bacterial Pathogens was examined against pathogenic bacteria, *S.aureus*, methicillin-resistant *S.aureus* (MRSA), *K.pneumonia* and *P.aeruginosa* and out of these four extracts, distilled extracts exhibit the most potent antibacterial effects equally on all the organisms. (Darioush *et al.*, 2016)

Antimicrobial Activity of aqueous extracts of peel and juice from lemon against 6 Gram-positive and 8 Gram-negative bacteria including *S. aureus, S.pyogenes, S.pneumoniae, K.pneumoniae, E.coli, M.catarrhalis,* and *Candida albicans* showed that juice of *Citrus limon* had the maximum MIC of 30mm in *M.catarrhalis, K.pneumoniae* and *Candida albicans* and least in *E. coli* (10mm). (Nada *et al.*,2013)

Alhoi *et al.,* (2018) conducted antimicrobial activity of lemon (*Citrus limon*) peel extract against *E.coli*andreported that lemon (*Citrus limon*) peel extract have a high potential on antimicrobial activity against the *E.coli*.

Comparative studies of Antibacterial Effect of some Antibiotics and Ginger (*Zingiber officinale*) on two pathogenic bacteria was conducted and showed that ginger extract of both the plant and root showed highest antibacterial activity against *S.aureus* and *S.pyogenes* while the three antibiotics used (chloramphenicol, ampicillin and tetracycline) were also active but at less extent compared to ginger extract (Sebiomo *et al.*, 2011)

Hasanain *et al.,* (2016) reported that the antibacterial effect of Ginger was high compared to Streptomycin, Rifambin and Cefotoxime with a highest MIC in *Pseudomonaseurogenosa* and

lowest in *Proteus mirabilis*. Muhsin *et al.*,(2014) studied the antibacterial effect of ginger and garlic extracts along with some antibiotics (cloxacillin etc) to compare the effects of the extracts. Both ginger and garlic extract have antibacterial activity (especially the ethanolic extract) against some pathogenic G+ve and G-ve bacteria.The highest MIC was in *S.aureus* and lowest in *S.pyogens.*

Antibacterial effect of garlic (*Allium sativum*) on *S.aureus* showed that Garlic has both a bacteristatic and bactericidal activity when tested in vitro using crude preparation of garlic. Therefore, garlic may be used successfully for treating food poisoning causative agent like *S.aureus* (Deresse *et al.,* 2011). Antibacterial Effect of Aloe vera (*Aloe barbadensis*) leaf gel against *Staphylococcus aureus,Pseudomonas aeruginosa*, *Escherichia coli* and *Klebsiella pneumonia*e was studied and it was observed that ethanolic extract of Aloe vera leaf gel possesses antibacterial effect against the test pathogens and MIC was highest in *S.aureus*, and lowest in *P.aeruginosa*(Haque *et al.,* 2019).

Supreet *et al.,* (2016) conducted In - vitro Study of the anti-microbial and inhibitory activities of various concentration of Aloe Vera Gel (AVG) against oral patho- genic bacteria and reported that at 100% AVG concentration, zone of inhibition was highest in *A.actinomycetemcomitans* and lowest in *S.aureus*.

Amir *et al.,* (2014) reported Antibacterial Effect of Garlic Aqueous Extract on *Staphylococcus aureus* in Hamburger. It was observed that the growth of *S.aureus* was significantly decreased by the 2 and 3-mL extracts.

Xiaonan *et al.,* (2011) investigated the cell injury and inactivation of *Campylobacter jejuni* from exposure to antioxidants from garlic. *C. jejuni* caused food poisoning and when it was treated with various concentrations of garlic concentrate and garlic-derived organosulfur compounds garlic showed great antibacterial effect on *C.jejuni*.

Antibacterial effect of different concentrations of garlic (*Allium sativum*) extract on dental plaque bacteria was studied and found effective against all the test organisms and showed highest zone of inhibition in *S.mutans,S. sanguis, and S. salivarius*(Behzad *et al.,*2011)

Tessema *et al.,* (2006) carried out in vitro assessment of the antibacterial effect of garlic (*Allium sativum*) on bacterial isolates from wound infections. All the tested organisms were inhibited by 33.75 mg/ml of the crude preparation of garlic except control organism and clinical isolates of *S. aureus*, which were inhibited by 11.25 mg/ml of crude garlic.

Antibacterial effect of Crude Turmeric paste aqueous turmeric extract, and standard antibiotic Amikacin against *Staphylococcus aureus* and *Escherichia coli*was studied. It was shown that the

MIC of Amikacin was the lowest in comparison to MIC of Aqueous Turmeric extract for complete inhibition of growth of *Staphylococcus aureus* and *Escherichia coli* (Afrose *et al.*,2015).

Antibacterial properties of *Azadirachtaindica* (neem) or *Curcuma longa* (turmeric) against *Enterococcus faecalis* with those of 5% sodium hypochlorite or 2% chlorhexidine as root canal irrigants *in* vitro was conducted. Chlorhexidine or neem exhibited the greatest antibacterial activity when used as endodontic irrigants against *E. faecalis*, followed by sodium hypochlorite, suggesting that it offers a promising alternative to the other root canal irrigants tested (Dakshita *et al.*,2017).

Phytochemical analysis and comparative study of antibacterial effect of turmeric extracts using different solvent has shown that fabrication of silver nano-composite films impregnated with curcumin showed the stronger antibacterial activity against *E. coli*. Therefore, Curcumin-nano-composite coated material for wound dressing show increased efficiency (Piyali *et al., 2018*).

Curcumin has a property of antibacterial activity against periodontopathic bacteria and may be effective agent for preventing periodontal diseases. Curcumin shows therapeutic role in dentistry too (Rasika *et al*., 2017)

The antibacterial effects of crude ethanol and aqueous extracts of Turmeric, Ginger and Turmeric and Ginger combined on some Pathogenic organisms was studied. It was proved that combined extracts of *C. longa* and *Z. officinale* exhibited higher antibacterial activity than *C.longa* alone. Ginger extracts were most effective. This exhibit an interesting promise of designing a potentially active antibacterial combined agents of plant origin (Kelechi *et al.*, 2016).

The combination of plant extract and antibiotics at low concentration was tested against pathogens. It showed that this alternative way of treatment can serve an important platform for the development of inexpensive, safe and effective way of treatment (Ankita *et al.*2017)

The silver nanoparticles, graphene oxide nanoparticles and GO-Ag nanocomposites were synthesized from seed extracts of Amla fruit. Silver, Graphene oxide nanoparticles and GO-Ag nanocomposite showed good antibacterial effect against oral pathogens with minimal cytotoxicity (Subhashree *et al.*,2020).

Antimicrobial potential of aqueous extracts and solvent extracts (ethanolic, methanolic, ethyl acetate and chloroform) of *Emblica officinalis* (amla) against selected bacterial strains was tested. The agar well diffusion technique and disc diffusion methods were employed. Amla fruit protein extracts exhibited antibacterial activity against Staphylococcus *aureus, Bacillus cereus, Bacillussubtilis* and *Escherichia coli* (Surbhi *et al.*,2012)

Antibacterial effects of three types of onions; red, green and white onion shown inhibitory effects on the growth of all investigated bacteria; however, their antibacterial effects varies according to onion type and its water extraction concentration as well as on the type of tested bacteria.Flavonoids found in vitro had been an effective antimicrobial substance against wide array of microorganisms, such as viruses and bacteria (Ahmed *et al.,* 2016).

The activity of preventing the growth of bacteria was enhanced by prolonging the infusion of garlic or Onions. Additionally, neither a synergistic nor an inhibitory effect is related to concentration changes (Ahmed *et al.,* 2022).

Red onion can induce epidermal keratinocyte differentiation and improve the recovery of skin barrier functions and also could be a potential candidate enhanser for the skin care and cosmetology (Dae *et al.,* 2012)

In the Study on Antibacterial Effect of Some Allium Species,the extracts that prepared from bulbs of this species were more effective as antibacterial effects against all tested organisms. Results showed that the highest antibacterial activity of *A. atroviolaceun* was against *B. subtilis* with diameter of inhibition zone (DIZ) 42.6 mm and the lowest was against *K. pneumoniae* (DIZ = 3.8).(Abdol *et al*., 2007)

METHODOLOGY

Materials Required: nutrient broth, agar-agar, distilled water, filter paper, petri plates, conical flask, test tubes, forceps, cotton plugs, sterile swab, weighing machine, measuring cylinder, nichrome loop, ethanol, newspaper, etc.

Samples:
Ginger
Garlic
Onion
Lime
Aloe Vera
Turmeric
Amla

Nutrient broth culture: 0.65g of nutrient broth was weighed and added to 50ml distilled water and mixed well. The broth was then poured into test tubes and closed using a cotton plug and it was sterilized by autoclaving for 15 min and cooled to room temperature.

Inoculating the broth: The cotton plug from the stock culture tube was removed and the mouth was flamed. The sterilized loop was inserted into the culture tubecarefully without touching the side to prevent contamination. A visible amount of inoculum was removed using the loop and the inoculum was introduced into the culture tubes with sterile nutrient broth. The mouth of the tube was plugged back carefully after flaming. The inoculating loop was re sterilized and the broth culture was gently rotated for proper mixing of contents. The contents in each test tube were labelled with the names of respective microbes and the date was noted. For sufficient bacterial growth, inoculums were kept for 24 hours of incubation.

Preparation of nutrient agar (culture media): The medium was prepared using 1.3g of nutrient broth and 2.0g of agar/ 100ml. Both the nutrient broth and agar was weighed out and was made into 100ml using distilled water. It was poured into a conical flask and sterilized for 15 min in an autoclave at 15psi. The medium was allowed to cool to pinna bearing heat. Cooled agar was poured into petri dishes and waited till it get set. It was then kept upside down. These petri dishes were used for further study.

Preparation of extracts from the sample: Samples were collected and washed with distilled water, 8g of each sample was weighed, and 10 ml water was added to it and ground using mortar and pestle. This extract was filtered and extracts were collected in bottles.

Preparation of the discs: 0.6 cm diameter filter paper discs were punched out and sterilized by autoclaving. It was then dipped with sample extract and used to test for antibacterial sensitivity.

Kirby Bauer disc diffusion method (Bauer *et al.,* 1959).

A lawn culture of each bacterium was prepared. A sterilized swab was dipped into bacterial suspension, and moved side to side from top to bottom leaving no space uncovered. The plate is rotated to 90° and the same process was repeated so that the plate was coated with bacteria. Once the lawn has been prepared the sterilized filter paper was dipped with sample extracts and placed on the plates. This plate was incubated at 37°C for 48 hrs. The name of the bacteria was labelled on each plate and was examined for sensitivity (zone of inhibition). The diameter of each zone was measured using a standard ruler in centimeters. A particular strain of bacteria is found to be sensitive to the sample extract, if the bacteria show only feeble growth all around the disc. On the other hand if the bacteria show more number of colonies, then the bacterial strain is resistant to the sample extract. Observations were made accordingly.

Killing and disposing: After the experiment, the bacteria are destroyed by autoclaving the plates for 20 min. All the glassware used for the experiment were also autoclaved to remove any bacteria if present.

OBSERVATION AND RESULTS

The present study was conducted to obtain the effect of various homemade remedies on different strains of bacteria.

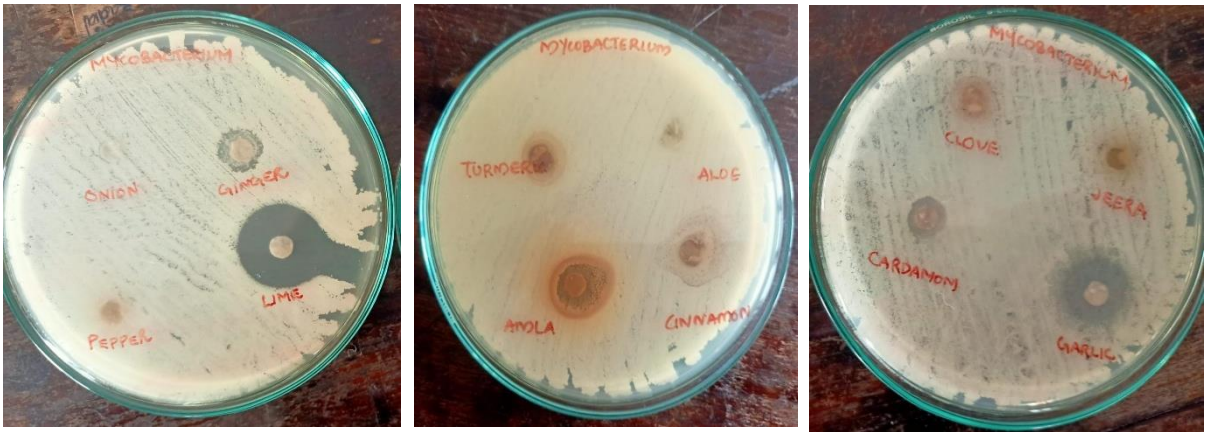


Fig 1. SHOWING THE CLEARING ZONE OF VARIOUS HOME REMEDIES ON *Mycobacterium*.

In *Mycobacterium*, lime has shown the highest clear zone of 2cm whereas Amla showed the least with a zone of 0.9 cm. Onion, ginger, turmeric and Aloe vera has not shown any clearing zone for *Mycobacterium*.

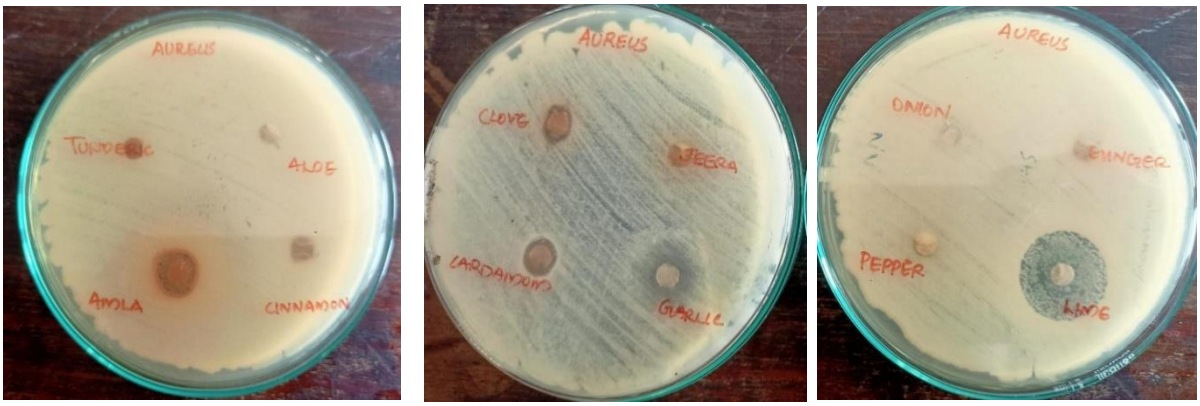


Fig 2. SHOWING THE CLEAR ZONE OF VARIOUS HOME REMEDIES ON *Staphylococcus aureus.*

In this case, Lime has shown the highest clear zone of inhibition of 2.7 cm and Amla shown the least zone of 1.1 cm, the rest of the samples have not shown any clear zone.

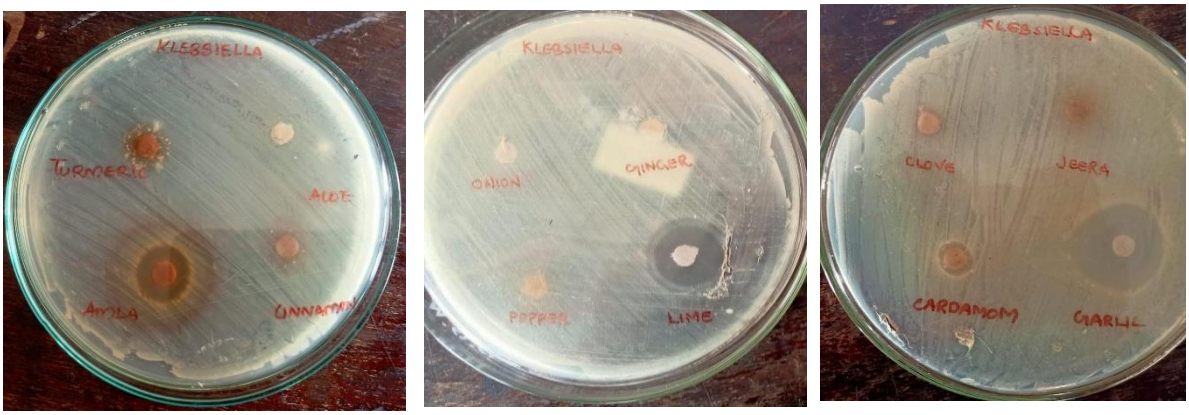


Fig 3. SHOWING THE CLEAR ZONE OF INHIBITION OF VARIOUS HOME REMEDIES ON *Klebsiella pneumonia.*

Garlic shows the highest clear zone for *Klebsiella* of 2.2cm and Amla shows the least with a zone of 1.2cm. Onion, ginger, turmeric and Aloe vera didn't show any clear zone.

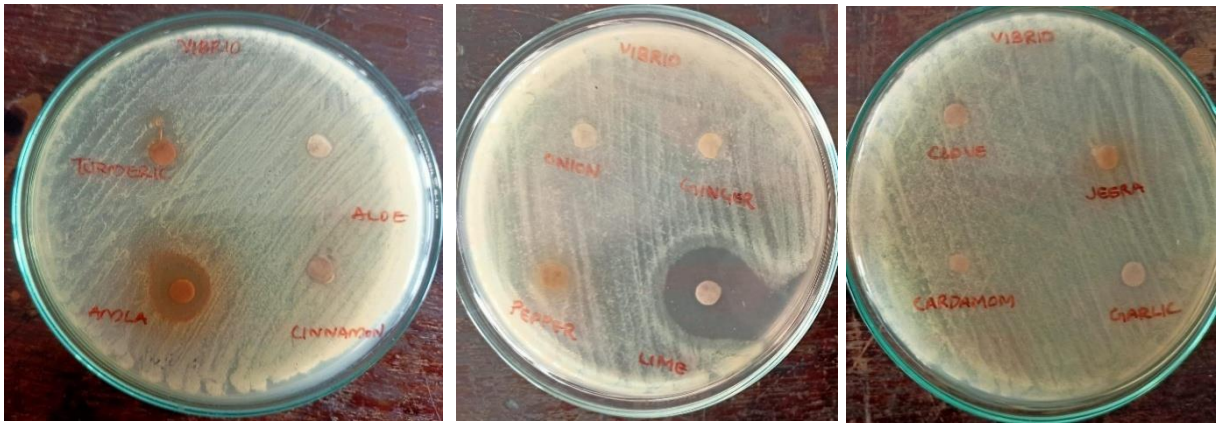


Fig 4. SHOWING THE CLEAR ZONE OF INHIBITION OF VARIOUS HOME REMEDIES ON *Vibrio parahaemolyticus.*

In case of *Vibrio*, Lime with 2cm showed the highest clear zone while the aloe vera had the least with a zone of 0.6cm. Garlic, onion, ginger shows no effect against this bacteria.

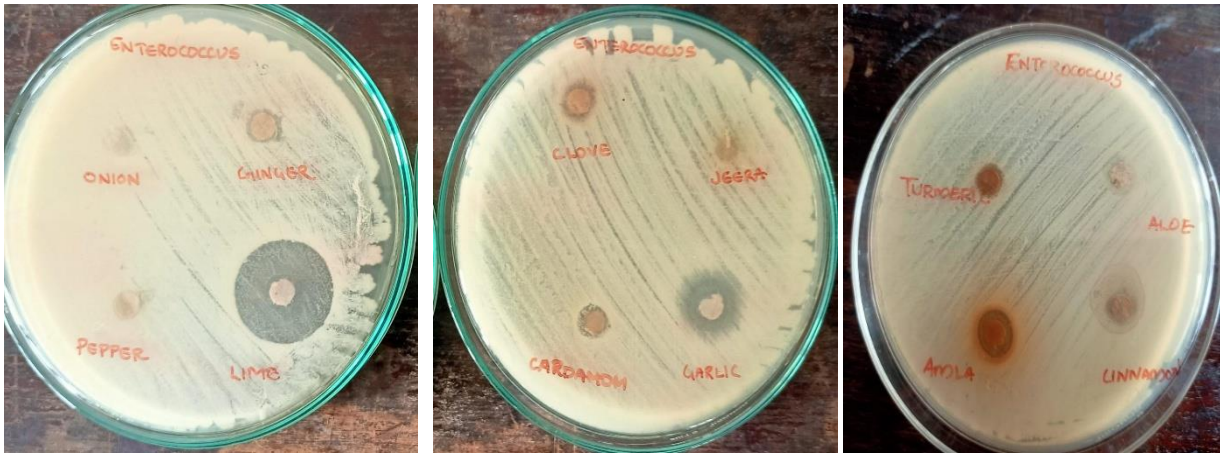


Fig 5. SHOWING THE CLEAR ZONE OF INHIBITION OF VARIOUS HOME REMEDIES ON *Enterococcus faecalis.*

Lime shows the highest clear zone of 2.2cm and ginger and onion shown the least with a zone of 0.8cm. Turmeric, aloe vera and Amla have not shown any effect.

Fig 6. SHOWING THE CLEAR ZONE OF INHIBITION OF VARIOUS HOME REMEDIES ON *Escherichia coli.*

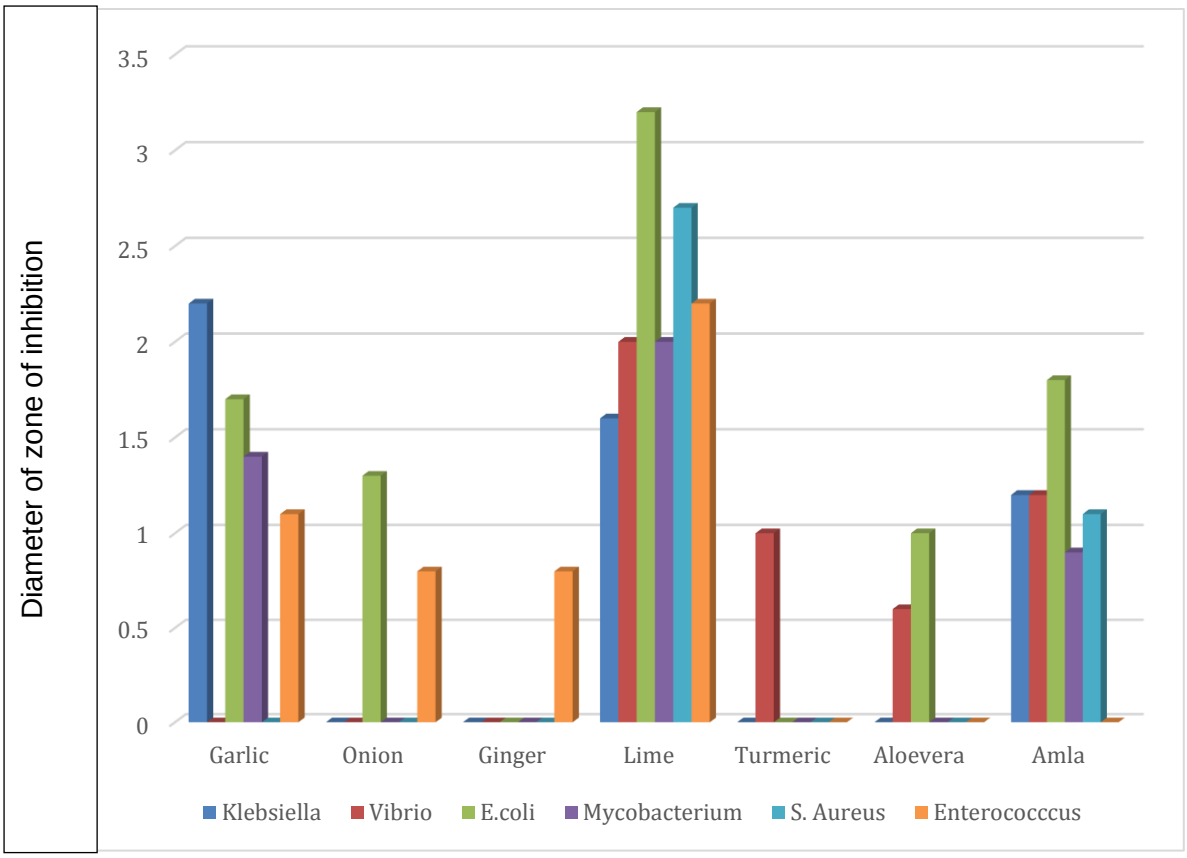
Lime had the highest clear zone of 3.2 cm against *E. coli*. Aloe vera showed the least with a zone of 1cm. Ginger and turmeric has not shown any clear zone for *E. coli.*

The results are shown in the below table:

TABLE 1. SHOWING THE DIAMETER OF ZONE OF INHIBITIONOF VARIOUS HOME REMEDIES ON DIFFERENT STRAINS OF BACTERIA

SL. NO.	ITEM	DIAMETER OF ZONE OF INHIBITION(IN CM)					
		Klebsiella	*Vibrio*	*E. coli*	*Mycobacterium*	*S. aureus*	*Enterococcus*
1.	GARLIC	2.2	0	1.7	1.4	0	1.1
2.	ONION	0	0	1.3	0	0	0.8
3.	GINGER	0	0	0	0	0	0.8
4.	**LIME**	**1.6**	**2**	**3.2**	**2**	**2.7**	**2.2**
5.	TURMERIC	0	1	0	0	0	0
6.	ALOEVERA	0	0.6	1	0	0	0
7.	AMLA	1.2	1.2	1.8	0.9	1.1	0

From this table it is clear that **lime** is active against all the six strains of bacteria used. Whereas**ginger and turmeric** has only shown activity against least bacteria used. Lime showed the greatest sensitivity against *E. coli* with an inhibition zone of 3.2 cm and least for *Klebsiella* with azone of 1.6 cm.



GRAPH 1. SHOWING THE DIAMETER OF ZONE OF INHIBITION OF VARIOUS HOME REMEDIES ON DIFFERENT STRAINS OF BACTERIA

From the graph it is clear that in the case of *Citrus limon* (lime), the highest sensitivity was shown for*E.coli* which producedan inhibitory zone of 3.2 cm in diameter. A zone of 2.7 cm was noticed for *Staphylococcus aureus*, 2.2 cm for *Enterococcus*, 2 cm for *Mycobacterium* and *Vibrio* and 1.6 cm for *Klebsiella*.

The Second highest activitywas shown by *Phyllanthusemblica* (amla).*E.coli* showed the greatest sensitivity with an inhibitory zone of 1.8cm followed by 1.2 cm for *Klebsiella* and *Vibrio*, 1.1cm for *S. aureus* and 0.9 cm for *Mycobacterium*.
In case of *Allium sativum* (garlic), the zone was2.2cm for *Klebsiella*, 1.7, 1.4 and 1.1 cm for *E.coli* ,Mycobacterium and Enterococcus respectively.

For *Allium cepa* (onion), *E.coli* showed the greatest sensitivity with an inhibitory zone of 1.3 cm, followed by *Enterococcus* with a zone of 0.8 cm.
In the case of *Aloe vera* (aloe vera), only *E.coli* and Vibrio showed an inhibitory zone of 1 and 0.6 cm respectively.
For *Curcuma longa* (turmeric), *Vibrio* had a zone of 1cm and for *Zingiber officinale* (ginger) *Enterococcus* had a zone of 0.8 cm.

DISCUSSION

Natural products have served as powerful therapeutics against pathogenic bacteria since the golden age of antibiotics of the mid-20th century. A home remedy is a treatment to cure a disease or ailment that employs certain spices, herbs, vegetables, or other common items. They are well known for antibacterial effect.

The home remedies taken for this project were ginger, garlic, onion, lime, aloe vera, turmeric and amla against six different species of bacteria including both gram negative and positive bacteria such as *E.coli, Enterococcus, S.aureus, Vibrio, Klebsiella and Mycobacterium.*

From the study it was found that the different types of home remedies have significant antibacterial activities. However there were few which showed comparatively greater antibacterial activity and some which didn't showed any effects.

The study concludes that the many of the home remedies show antibacterial properties effectively. Out of the items taken highly resistant ones showed less inhibition zone compared to that of the more effective home remedies.

An overall result shows that lemon showed the highest antibacterial activity against *E. coli* with a zone of inhibition of 3.2 cm. The most sensitive bacteria was *Escherichia coli* and the most resistant among the 6 bacteria taken was *Staphylococcus aureus.*In the present study out of the six bacteria *S.aureus* and *Vibrio* showed complete resistance and in *E. coli, Klebsiella, Mycobacterium and Enterococcus* varying zone of inhibition was observed. The highest zone of inhibition of 2.2cm was seen in *Klebsiella* against garlic. Garlic contains allicin, which can effectively fight against many strains of bacteria. According to Deresse *et al.,* (2011) and Muhsin *et al.,* (2014) both the studies concluded that Garlic is effective against *S.aureus.*

In the present study except *E. coli* and *Enterococcus* other four bacteria showed complete resistance towards onion extract. The highest zone of inhibition of 1.3cm was seen in *E. coli* and *Enterococcus* showed a zone of inhibition of 0.8cm. According to Ahmed *et al.,* (2016) onions were effective against bacteria which are similar to the result of present study. They were effective as onion is a rich source of therapeutic sulfur compounds called cysteine sulphoxides besides containing flavonoids that have amazing antibiotic effects.

The ginger extract showed the antibacterial effect only on the bacteria*Enterococcus* and all other 5 bacteriashowed no effect on ginger. *Enterococcus* showed a zone of inhibition of 0.8cm. Sebiomo *et al.,* (2011) reported that ginger was effective against *S.aureus*. Ginger contains

gingerol, terpenoids, shogaol, zerumbone and zingerone as well as powerful flavonoids with anti-microbial properties. It can help fight many strains of bacteria effectively.

Lime was effective against all of the bacteria that were taken. Lemon extract showed the highest zone of inhibition of 3.2cm on *E. coli* and the least zone of inhibition 1.6cm was observed on *Klebsiella*. According to Nada *et al.,* (2013) the lowest zone of inhibition was observed in *E. coli*.

The turmeric extract showed the antibacterial effect only on the bacteria, *Vibrio* and all other 5 bacteriashowed no effect on turmeric. *Vibrio* showed a zone of inhibition of 1cm. According to Dakshita *et al.* (2017), turmeric was shown effective against Enterococcus.

Aloe showed a positive effect on both *Vibrio* and *E. coli*. All other bacteriashowed no effect on aloe gel extracts. The highest zone of inhibition of 1cm was observed in *E.coli*. According to Supreet*et al. (*2016) the lowest zone of inhibition was seen in *S.aureus* which is similar to the present study. Aloe vera is known for its antibacterial, antiviral, and antiseptic properties and may help heal wounds and treat skin problems.

Amla had comparitively an equal value of zone of inhibition on all bacteria except *Enterococcus*. The highest zone of inhibition of 1.8cm was observed in *E.coli* and *Enterococcus* does not showany effect on amla. According to Surbhi *et al.* (2012) Amla was effective against *E.coli* which was similar to that of the present study. Amla fruit is a rich source of ascorbic acid (vitamin C), carotene. It contains different polyphenols such as ellagic acid, gallic acid, apigenin, quercetin, luteolin, and corilagin thus exhibiting high anti-bacterial effects.

CONCLUSION

The present study revealed that among the seven samples of home remedies taken, the *Citrus limon* exhibited the highest antibacterial sensitivity against all the six strains of bacteria tested namely, *Klebsiella pneumonia, Vibrio parahaemolyticus, Escherichia coli, Staphylococcus aureus, and Enterococcus faecalis* and *Mycobacterium*. Among this *Escherichia coli* exhibited maximum inhibitory zone of 3.2 cm.

Phyllanthus emblica (amla) showed the second highest inhibition against five strains of bacteria excluding *Enterococcus faecalis.*

Out of the six strains of bacteria, *Escherichia coli* and *Enterococcus faecalis* were the most sensitive bacteriaas they exhibitedhighest sensitivity to the most of the samples tested. Turmericand ginger showed the least sensitivity and only exhibited activity against *Vibrio* and *Enterococcus* respectively.

Many a times allopathic medicines actually help provide relief and treat only symptoms, whereas natural remedies cure and heal ailments from their roots. Therefore natural home remedies are the safest option to relay on in treating any infections.

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