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Study on antimicrobial activities of few medicinal plants - A Review

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ABSTRACT

The primary purpose for the review articles tells about the present and past of the work were the development of the studies were *Invitro* antimicrobial and the technique of the research was developed into day to day life because the microbes are easily multiplied certain period best example is *E.coli*. Plants are most important all living nature. The medicinal plants are an essential source of bio-compounds that may serve as novel chemotherapeutic agents for certain diseases. Plants have root, leaf, steam and strength of the activity of the product of the valuable medicinal plants as using the different chemical mixture for solvent extraction like (Petroleum ether, chloroform, ethyl acetone, methanol, diethyl ether, water extract)for different activity studies in microorganisms (*Escherichia coli, Klebsiella pneumonia , Proteus vulgaris and psedudomon asaeruginosa, Bacillus cereus, Pseudomonas aeruginosa, Proteus mirabilis, Pseudomonas fluorescent).* The present research and scientific aim of goal medicinal plants are more potential to kill different microbes and different parts of the plant body.

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INTRODUCTION

The term “medicinal plant” includes various types of plants used in herbal medicine It is the use of plants for medicinal purposes. The word Ayurveda is referred of life "AYUR" and meaning of Veda is called the science of knowledge. The practices of the Ayurveda of Indian system between 2000-5000 year ago. The Ayurveda were most developed from the proper way of systematic spiritually of the rishi.

The paper tells about you the common activity of the effectivity of plants from various microbial diseases. The activity of antibacterial and antifungal more than 20 different plants from various part of the plant material (leaf to root) was studied for antibacterial and antifungal. Nowadays the Ayurvedic pharmacopoeia the ministry of AYUSH was developed the standard protocols of different plant activity using different solvent. The 20-30% of the pharmaceutical companies were developing plant-based drugs. The day by day people was slowly reduced synthetic drugs because a side effect was started slowly the plant-based compound were induced more phytochemical activity.

The best way of the systematic investigation antibacterial activity (Shanthi *et al., 2013*) explains about *Tinospora cordifolia* is most used urinary tract disease. (Para Sujana *et al., 2013) Menthe Piperita* L. extract is used to more effective in *e.coli, Bacillus subtilis. Cucurbita maxima* (Murugananthan *et al., 2016)* it is used for heart diseases the study of bacterial activity gives the alternative antibiotics for microbes.

Tinospora cordifolia

Part used – Leaves and steam

Extracted with: The extract with powdered form solvent contain ethanol: water (4:1)

The extract with paste form solvent contain chloroform: water (4:1)

Antimicrobial activities: Antibacterial

Bacterial strains: *Escherichia coli, Klebsiella pneumonia, Proteus vulgaris and Pseudomonas aeruginosa.*

Assays – Agar well diffusion method. The broth culture of bacterial strains using the medium as Mueller Hinton Agar the wells were made using a sterile well cutter (6mm). The extracts were using various concentrations of 200, 300 and 400ug/ml.

Results reported: In the form of ethanol extract of leaf *Tinospora acordifolia* the maximum inhibitory activity against *Klebsiella pneumonia, Pseudomonas aeruginosa*. Meanwhile, chloroform extract of leaf showed moderate activity against *Klebsiella pneumonia, Pseudomonas saeruginosa* but the poor effect in *E.coli* (Shanthi.V et al., 2013). As such ethanol extract of stem maximum inhibitory activity against *Klebsiella pneumonia* the moderate pathogen expert *Proteus vulgaris.*Chloroform extract of stem maximum zone of inhibition against *Pseudomonas aeruginosa* the moderate inhibition was observed against *Klebsiella pneumonia, E.coli.* extract of both poor activity of all test pathogens *proteus vulgaris* showed the resistance of tested extracts.

Azadirachta indica

Part used: Bark, leaves, fruits and roots.

Extracted with: oil of neem

Antimicrobial activities: Antibacterial activity.

Bacterial strains: *S.aureus, B.cereus, E.coli, S.typhimurium, P.aeruginsa.*

Method of assay: Aspartate aminotransferase, Alanine aminotransferase, Gamma-glutamyl transpeptidase

Results reported: Antimicrobial activity was more abundant in neem oil which revealed the antimicrobial potential and its significance of the oil against various strains from bacteria. *S.typhimurium*, *P.aeruginsa* strains are more resistance in antibacterial activity (Mohammed Asif 2012).

Eclipta alba

Part used: Whole plant

Extracted with: water extract, ethyl acetone, Petroleum ether, methanol, chloroform

Antimicrobial activities: Antibacterial activity.

Bacterial strains: *Escherichia coli, Staphylococcus aureus, Bacillus subtilis, Bacillus cereus, Pseudomonas aeruginosa, Proteus mirabilis, Pseudomonas fluorescent*

Method of assay: Disc diffusion method. The concentration of the plant extract is 1.0, 2.0, 5.0, 10.0mg/ml.

Results reported: Among the various chemical extract were used in that acetone, methanol extract *Eclipta alba* showed the highest zone of inhibition 17.4mm against *Proteus mirabilis* (Selvamani.S *et al.,* 2014).

Coscinium fenestrated

Part used: Stem and leaf.

Extracted with: Methanol

Antimicrobial activities: Antibacterial activity

Bacterial strains: *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis*

Method of assay: DPPT assay, ABTS radical scavenging for free radicals and antioxidant assay. For bacteria using agar disc fusion assay.

Results reported: Methanolic extract of stem showed maximum antibacterial activity against *E.coli*, but the leaf extract exhibited a maximum zone of inhibition in case of *S.aureus.*

Betulacyl indrostachys:

Part used: Leaves

Extracted with: Petroleum ether, chloroform, acetone and methanol by hot percolation method.

Antimicrobial activities: Antibacterial and antifungal activity.

Bacterial strains: *Escherichia coli, Pseudomonas aeruginosa, Bacillus cereus*

Method of assay: Well diffusion method

Results reported: The antibacterial activity study against all bacterial culture at the conc.200mg/ml in which the methanol extract showed maximum antibacterial activity when compared with other extracts. All extracts showed antifungal activity against all bacterial culture at a conc. 200 mg/ml (Rawat Suman *et al.,* 2014)

Hemides musindicus

Part used: Roots

Extracted with: Ethanol, methanol and aqueous

Antimicrobial activities: Antibacterial activity.

Bacterial strains:*Escherichia coli, Staphylococcus aureus , Klebseilla pneumonia, Salmonella typhiand, Vibrio cholera.*

Method of assay: Agar well diffusion method

Results reported: In ethanol and methanol maximum zone of inhibition were occur. The aqueous extract does not show any activity (Ratha M et al., 2012)

Vetiveria zizanoides

Part used: Roots

Extracted with: Ethanol, methanol and aqueous

Antimicrobial activities: Antibacterial activity.

Bacterial strains: *Escherichia coli, staphylococcusaureus, Klebseilla pneumonia, salmonella typhiand , vibrio cholera.*

Method of assay: Agar well diffusion method

Results reported: In ethanol and methanol maximum zone of inhibition were occur. The aqueous extract does not show any activity.

Cucurbita maxima

Part used: Flower

Extracted with: Ethanol, petroleum ether, diethyl ether, ethyl acetate.

Antimicrobial activities: Antibacterial and antifungal activity

Bacterial strains: *Escherichia coli, bacillus cereus, salmonellatyphi, E.faecalis.*

Method of assay: In Disc diffusion antibacterial activity, The different conc. Of samples 10mg/ml, 20mg/ml, 30mg/ml , 40mg/ml were 6mm sterile disc where chloramphenicol was used as positive control.

The antifungal activity study was done by the agar diffusion method. The total 8mm diameter wells were punched in the test sample the standard antibiotic fluconazole concentration 1mg/ml (Muruganantham.N *et al.,* 2016)

Results reported: Thus ethyl acetate fraction of *Cucurbita maxima* flowers showed the superior antibacterial and antifungal activity.

Tephrosia purpurea

Part used: Leaves

Extracted with: Hexane, Ethyl acetate, methanol, ethanol.

Antimicrobial activities: Antibacterial and antifungal activity

Bacterial strains: *Escherichia coli, Bacillus subtilis, Salmonella Typhi, Psedudomonasaeruginosa, Staphylococcus aureus.*

Method of assay: For an antibacterial study using cup-plate agar diffusion method.

Results reported: The antimicrobial activity was evaluated with an increase in the concentration of the extract from 25 to 100mg/ml, an apparent increase in antimicrobial activity was observed in all the extracts. The methanol extract concentration of 100mg/ml showed a higher degree of inhibition (Anuradha laishram *et al.,* 2013).

The comparative study of three plants using the microbes of *Staphylococcus aureus*

Part used: Leaf.

Plant name: *Pongamiapinnata*, *Curcuma longa* and *Menthe arvenis*.

Extracted with: Methanol, Ethanol and Aqueous

Antimicrobial activities: AntibacterialActivity.

Bacterial strains: *Staphylococcus aureus*

Method of assay: The agar diffusion method, mic assay.

Results reported: *S.aureus*, aqueous extract of menthe arvenis is more effective than the methanolic extracts and ethanolic extract, ethanolic extract of pongamiapinnata is more effective than the aqueous and methanolic extracts, ethanolic extract Curcuma longa leaf extract is more effective than that of aqueous and methanolic extracts.

Mentha piperita

Part used: Leaf, stem and root.

Extracted with: Petroleum ether, ethanol, methanol, hexane, chloroform, ethyl acetate

Antimicrobial activities: Antibacterial activity.

Bacterial strains: *Staphylococcus aureus , Escherichia coli, Klebseilla pneumonia, Streptococcus pneumonia.*

Method of assay: The agar well diffusion was slightly were modified using the nutrient agar inoculated using the spread plate method. Using strand antibiotic chloramphenicol (100ug/ml).

Results reported: Among the all extract ethyl acetate, chloroform and ethanolic leaf extract showed the highest activity and more effective (Para Sujana *et al.,* 2013). The root extract hexane chloroform, petroleum ether as no activity.

Aegle marmelos

Part used: Leaves, fruits and peels.

Extracted with: plant compound was dissolved in 70 percent ethanol and 80 percentage methanol, ethyl acetate and hot water in the ratio of 1:10 so that 1 gram of plant compound dissolved in 10 ml of using solvent.

Antimicrobial activities: Antibacterial activity.

Bacterial strains: *Pseudomonas aeruginosa, Staphylococcus aureus, Escherichia coli*

Method of assay: Mic, Antibiogram

Results reported: The using *Aegle marmelos* fruit and leaves extract using a solvent like ethanol and ethyl acetate using antibacterial activity is not a better activity but using hot water extract good activity. (AmitPandey *et al.,* 2011)

Melia azedarach

Part used: Leaves

Extracted with: Methanol, Ethanol, Petroleum Ether and Water.

Antimicrobial activities: antibacterial and antifungal activity.

Bacterial strains: *Bacillus cereus* , *Staphylocousaureus*, *Escherichia coli* , *Pseudomonas aeruginosa.*

Fungal strains: *Aspergillusniger*, *Aspergillusflavus, Fusariumoxisporum*, *Rhizopusstolonifer*

Method of assay: Agar well diffusion method, MIC, MBC, MFC.

Results reported: The ethanol, methanol, petroleum ether and aqueous extracts of *Melia azedarach* possess significant inhibitory effect against tested pathogens (Antara sen *et al.,* 2012). The results of the study support the folk flore claim along with the development of new antimicrobial drugs from both the plants.

Lantana camera

Part used: Leaves

Extracted with: Petroleum ether, chloroform, ethanol

Antimicrobial activities: Antibacterial Activity

Bacterial strains: *Staphylococcus aureus*, *Bacillus subtilis* and *Escherichia coli*

Method of assay: Agar well diffusion method

Results reported: It has been observed that *Staphylococcus aureus* was resistant to the ethanolic extracts, of petroleum ether and aqueous extracts, as no inhibition activity against *Bacillus subtilis*. Moreover, all the microorganisms used in this study were sensitive to chloroform extract (Mohapatra T. K *et al.,* 2011)

Jasminum Officinale

Part used: Whole plant

Extracted with: Ethanol; Ampicillin Sodium; Gentamicin hydrochloride.

Antimicrobial activities: Antibacterial activity

Bacterial strains: *Staphylococcus aureus*, *Enterococcusfaecalis*, *Escherichia coli*, *Pseudomonas aeruginosa*

Method assay: Broth dilution assay, Agar diffusion assay

Results reported: The MIC value of gentamicin against *S. Aureus* and *E. coli* were 0.5 µg/mL and 1 µg/mL respectively, while the MIC value of gentamicin against both *E. faecalis and P. aeruginosa*was 10 µg/mL. Further, in agar diffusion assays, S*. aureus, E. faecalis and E. coli* were sensitive to both ampicillin and gentamicin and *P. aeruginosa*was sensitive to gentamicin (Shahbaa M *et al.,* 2015).

Punicagranatum

Part used: Fruit

Extracted with: Water-methanol, ethanol and acetone

Antimicrobial activities: Antibacterial.

Bacterial strains*: Staphylococcus aureus, Yersinia enterocolitica, Listeria monocytogenes, Candidautilis, Saccharomyces cerevisiae, and Aspergillusniger*.

Method of assay: Minimal inhibitory concentration (MIC), Total phenolic content.

Results reported: The MIC values used for test bacteria seemed to correlate with the total phenolic content found in the extracts. The total phenolic content of hot-water extracts of fruit peels was the highest, followed by the ethanol and acetone extracts, respectively. (Tianchai Nuamsetti *et al.,* 2012).

Garcinia mangostana:

Part used: Whole peel (outer and inner peels), leaves, and bark.

Extracted with: Ascorbic acid, cinnamon and citrus essential oils

Antimicrobial activities: Antibacterial.

Bacterial strains: *Escherichia coli, Listeria monocytogenes* and *Staphylococcus aureus*

Method of assay: Minimal inhibitory concentration (MIC).

Results reported: The MIC and MBC of the tested extracts ranged from 0.05 to 6.25 mg/ml against the 3 tested microorganisms. This experiment confirmed the strong antibacterial activity of mango stem showed positivity on Gram-positive bacteria but no activity on Gram-negative bacteria. (Palaka wong *et al.,* 2011).

Table 1: Anti-microbial activity of herbs

Name of plant	Part of plant	Compounds	Assays	microbes
Tinospora cordifolia	Leaves and steam	ethanol: water (4:1) chloroform: water (4:1)	Agar well diffusion method	*Escherichia coli, Klebsiella pneumonia, Proteus vulgaris and Pseudomonas aeruginosa*
Azadirachta indica	Bark, leaves, fruits and roots	oil of neem	Aspartate aminotransferase, Alanine aminotransferase, Gamma-glutamyl transpeptidase	*S.aureus, B.cereus, E. Coli, S.typhimurium, P.aeruginsa.*
Ecliptaalba	Whole plant	Petroleum ether, chloroform, ethyl acetone-methanol, water extract	Disc diffusion method	*staphylococcus aureus, bacillus subtilis, Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, proteus mirabilis, pseudomonas fluorescent*
Coscinium fenestrated	Stem and leaf.	methanol	DPPT assay, ABTS	*staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis*
Betula cylindrostachys	leaves	petroleum ether Chloroform, acetone and methanol by hot percolation method.	well diffusion method	*Escherichia coli, Pseudomonas aeruginosa, bacillus cereus*
Hemidesmus indicus	Roots	Ethanol, methanol and aqueous	Agar well diffusion method	*Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia, salmonella typhi and Vibrio cholera*
Vetiveria zizanoides	Roots	Ethanol, methanol and aqueous	Agar well diffusion method	*Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia, salmonella typhoid, Vibrio cholera*
Cucurbita maxima	Flower	Ethanol, petroleum ether, diethyl ether, ethyl acetate	Disc diffusion method	*Escherichia coli, Bacillus cereus, salmonella typhi, e.faecalis.*
Tephrosia purpurea	Leaves	Hexane, Ethyl acetate, methanol, ethanol.	the cup-plate agar diffusion method	*Escherichia coli, bacillussubtilis, salmonella typhi, Pseudomonas aeruginosa, Staphylococcus aureus.*
Pongamia pinnata, *Curcuma longa* and *Menthe arvenis*	Leaf	Methanol, Ethanol and Aqueous	agar diffusion method, mic	*Staphylococcus aureus*

Table 2: Anti-microbial activity of herbs (Continued)

Name of plant	Part of plant	Compounds	Assays	microbes
Mentha piperita	Leaf, stem and root.	Petroleum ether, ethanol, methanol, hexane, chloroform, ethyl acetate	agar well diffusion	*Staphylococcus aureus, Escherichia coli Klebseilla pneumonia, streptococcus pneumonia.*
Aegle marmelos	Leaves, fruits and peels	plant compound was dissolved in 70 percent ethanol and 80 percentage methanol, ethyl acetate and hot water in the ratio of 1:10 so that 1 gram of plant compound dissolved in 10 ml of using solvent	Mic, Antibiogram	*Pseudomonas aeruginosa, Staphylococcus aureus, Escherichia coli*
Melia Azedarach	Leaves	Methanol, Ethanol, Petroleum Ether and Water	Agar well diffusion method, MIC, MBC, MFC	*Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa.*
Lantana camera	Leaves	Petroleum ether, chloroform, ethanol	Agar well diffusion method	*Staphylococcus aureus*, *Bacillus subtilis*and *Escherichia coli*
Jasminum Officinale	Whole plant	Ampicillin sodium; Gentamicin hydrochloride	Broth dilution assay, Agar diffusion assay	*Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli* A, *Pseudomonas aeruginosa*
Punica granatum	Fruit	Water-methanol, ethanol and acetone	Minimal inhibitory concentration (MIC), Total phenolic content.	*Staphylococcus aureus, Yersinia enterocolitica, Listeria monocytogenes, Candidautilis, Saccharomyces cerevisiae, and Aspergillusniger*
Garcinia mangostana	Whole plant leaves, and bark	Ascorbic acid, cinnamon and citrus essential oils	Minimal inhibitory concentration	*Escherichia coli, Listeria monocytogenes , Staphylococcus aureus*
Zingiber officinale	Ginger powder	Soybean oil	Disc diffusion assay	*Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Vibrio cholerae, Klebsiella spp., and Salmonella spp*
Allium sativum	Whole plant	Ethanol 95%.	Well diffusion method	*Staphylococcus aureus*
Curcuma longa	Rhizome	Sterile distilled water	Minimum Inhibitory Concentration	*R. solanacearum*

Zingiber officinale

Part used: Ginger powder

Extracted with: Soybean oil

Antimicrobial activities: Anti-microbial activity

Bacterial strains: *Escherichia coli, Pseudomonas aeruginosa,*

Staphylococcus aureus, Vibrio cholerae, Klebsiella spp., and Salmonella spp

Method of assay: Disc diffusion assay

Results reported: The antimicrobial activity of the ginger was to be found high against *Salmonella spp* and low activity against *Escherichia coli*. *Staphylococcus aureus* showed lower sensitivity to ginger extract as compared to the most other Gram-negative bacteria (Kamrul Islam *et al.,* 2014).

Allium sativum

Part used: Whole garlic

Extracted with: Ethanol 95%.

Antimicrobial activities: Anti-microbial activity

Bacterial strains: *Staphylococcus aureus*

Method of assay: Well diffusion method

Results reported: In this study, the Garlic possessed anti-bacterial effect against *Staphylococcus aureus*, and the sensitivity of the bacteria was gradually increased with the dose-dependent manner (Atheer Abdulhameed Khashan, 2014).

Curcuma longa

Part used: Rhizome

Extracted with: Sterile distilled water

Antimicrobial activities: Anti-microbial activity

Bacterial strains: R*. solanacearum*

Method of assay: Minimum Inhibitory Concentration

Results reported: Antibacterial effect of *Curcuma longa* shown against bacterial wilt pathogens. Turmeric extracts of the rhizome are a preliminary test of antimicrobial activities against phytopathogenic bacteria, *R. solanacearum (*Narasimha Murthy et al., 2014*).*

CONCLUSION

The use of single herbal formulation has been the test carried out all the times. Based on this Ayush concept the herbal is known as a holistic approach for the treatment for various diseases. Various advancements like study various phytoconstituents and discovery methods and process to produce synergistically a desirable product with desirable effect has been much improved with herbal formulation and its comparative studies the medical properties which are found using their herbal studies such as anti-bacterial, anti-fungal activity and its different methods to known activity of plants are resistant to diseases.

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