WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 10, 308-324. Review Article ISSN 2277– 7105

ANTIMICROBIAL ACTIVITIES OF *TRICHOSANTHES DIOICA* (PATOLA), *ZINGIBER OFFICINALE* (SHUNTHI), *TINOSPORA CORDIFOLIA* (GUDUCHI) – A REVIEW

Neha C. Gangurde*[1] and Vd. Meenakshi Amrutkar*[2]

[1]P.G Scholar, [2]Asso. Professor, Reader,

Rasa Shastra Bhaishajyakalpana Y.M.T Ayurvedic Medical College and Hospital, Kharghar, Navi Mumbai.

Article Received on
23 June 2019,

Revised on 13 July 2019,
Accepted on 03 August 2019,

DOI: 10.20959/wjpr201910-15620

***Corresponding Author**
Neha C. Gangurde
P.G Scholar, Rasa Shastra Bhaishajyakalpana Y.M.T Ayurvedic Medical College and Hospital, Kharghar, Navi Mumbai.

ABSTRACT

Ayurvedic medicinal plants have been used for thousand of years to treat and prevent health disorders. *Patola (Trichosanthes dioica), Shunthi (Zingiber officinale), Guduchi (Tinospora cordifolia)* are amongst the prominent and potent ayurvedic drugs which play a vital role in the management and treatment of various diseases. The knowledge of their healing properties has been transmitted over the centuries among human communities. Active compounds produced during secondary vegetal metabolism are usually responsible for the biological properties of some plant species used throughout the globe for various purposes, including treatment of infectious diseases. Currently, data on antimicrobial activity of numerous medicinal plants so far considered empirical have been scientifically confirmed, with increasing number of reports on pathogenic micro organisms resistant to antimicrobials. Products derived from medicinal plants may potentially control microbial growth in diverse situations and in specific case of disease treatment, and many studies have aimed to describe the chemical composition of different extracts of these medicinal plants. Such research works and studies should be brought to the knowledge of mankind. Thus, in present study, above mentioned ayurvedic medicinal plants with emphasis on their antimicrobial activities are reviewed.

KEYWORDS: *Trichosanthes dioica, Zingiber officinale, Tinospora cordifolia*, phytochemistry, *ayurvedic*, antimicrobial activity, plant extracts.

INTRODUCTION

Ayurvedic herbs or medicinal plants have always played a vital role to treat several diseases of human beings. According to World health organisation (WHO) more than 80% of the world population relies on traditional medicine for their primary health care needs.[1] The use of medicinal plants as a source for relief from illness can be traced back over five mellenia to written documents of the early civilization in China, India and north east but it is thoughtless as art as old as mankind.[2] *Ayurvedic* medicinal plants are rich sources of antimicrobial agents and are used to get different rasayanas which possess different medicinal properties against different microbes. *Trichosanthes dioica (Patola), Zingiber officinale (Shunthi), Tinospora cordifolia (Guduchi)* are amongst the potent *ayuverdic* medicinal plants and are source of powerful and potential therapeutic drugs. These are mentioned in *ayurveda* for treatment and management of various diseases. Although many of plant species have been tested for antimicrobial properties, the majority of these have not been adequately evaluated[3].Considering the vast potentiality of above mentioned *ayurvedic* medicinal drugs for antimicrobial activities and in order to bring this knowledge forward for medical science and mankind, the present study is based on the review of these medicinal plants. In present paper, a brief description of *Trichosanthes dioica (Patola), Zingiber officinale (Shunthi), Tinospora cordifolia (Guduchi)* is presented and the work carried out by researchers using different extracts of these medicinal plants evaluating their pharmacology, phytochemistry and antimicrobial potency has been reviewed.

AIM AND OBJECTIVES

The aim of the current study is to shed light on the phytochemistry and antimicrobial activities of the ayurvedic herbs- *Trichosanthes dioica (Patola), Zingiber officinale (Shunthi), Tinospora cordifolia (Guduchi)* in different extracts with the objective of compiling and putting forward this knowledge for researchers and medical science.

MATERIALS AND METHODS

Literature search- Review Literature regarding the pharmacology of the *Ayurvedic* herbs is done from classics of *Ayurveda* and from various textbooks. The studies carried out to prove the antimicrobial potencies of the herbs have been taken from various research articles and papers published online and through medical magazines. All Complied matter is reorganized and critically analysed for the discussion and attempt has been made to draw some fruitful conclusions.

OBSERVATIONS AND RESULTS

- ***Trichosanthes dioica Roxb. (Patola)***

Trichosanthes, a genus of family *Curcurbitaceae*, is an annual or perennial herb distributed in tropical Asia, Polynesia and Australia and is cultivated throughout the plain of northern India from Punjab to Assam. Pointed gourd (*T.dioica*) is known by the name of *parwal, palwal, patol* and *patola* in different parts of India and Bangladesh. Juice of leaves of *T.dioica* is used as tonic, febrifuge, and in sub-acute cases of enlargement of liver and spleen.[4]

Botanical name- *Trichosanthes dioica*

Family - *Cucurbitaceae*

Hindi name- *Parval*

Sanskrit Synonyms - *Patola, Kulaka, Karkashacchada, Rajiphala, Beejagarbha, Pancha Rajiphala, Amrutaphala, Panduphala, Tiktottama, Naga Phala*.[5]

panchabhautik constitution of *patola*

Ayurvedic pharmacodynamic properties

Rasa: *Tikta, Katu*

Guna: *Laghu, Snigdha Ushna and Tikshna guna*

Veerya: *Ushna*

Vipaka: *Katu*

Chemical constituents and Phytochemistry

Pointed gourd is rich in vitamins and contains 9.0 mg Mg, 2.6 mg Na, 83.0 mg K, 1.1 mg Cu, and 17.0 mg S per 100 g edible part.[6] The seeds of *T. dioica* contain a large amount of peptides. The seed peptides have the unique property of being resistant to the action of silver nitrate, a sensitive reagent commonly used to stain proteins.[7] The various chemical constituents present in *T. dioica* are vitamin A, vitamin C, tannins, and saponin.[8] Phytochemical evaluations of aqueous and ethanolic extracts have shown the presence of saponins and tannins.[9] The seed extract of *T. dioica* contains 7-oxidihydrokarounidol-3-benzoate as the most predominant component in the highly polar fraction of the nonsaponifiable lipid.[10]

Two main phytosterols present in *T. dioica* are, namely, 24α-ethylcholest-7-enol and 24β-ethylcholest-7-enol.[11] Seeds of *T.dioica* also contain lectin, a carbohydrate (specifically galactose) binding protein which is homologous to type-II ribosome inhibitory proteins (type-

II RIP). Sultan and Kenoth (2004) have done purification, physicochemical characterization, saccharide specificity, and chemical modification of a Gal/GalNAc-specific lectin from the seeds of *T. dioica.*[12]

Kabir has evaluated that the seeds of *T. dioica* contain a large amount of peptides.[7] The seed peptides have the unique property of being resistant to the action of silver nitrate, a sensitive reagent commonly used to stain proteins. Sharma *et al*. have determined that the total phenolic content of *T. dioica* leaves was about two times more than that obtained from the fruits and seeds of *M. olifera* and *E. officinalis,* respectively.[13]

Phytochemical are non nutritive chemical compounds which occur naturally in plants are called phytochemicals, or the chemical which is derived from plants called phytochemical. Phytochemical words came from Greek word *Phyto*–plant and chemicals. The term phytochemical is generally used to those chemicals that may have biological importance but are not established as important nutrients. In a narrower sense the terms phytochemical describe the number of secondary metabolic compounds found in plants.

The main phytochemical groups that are present are alkaloids, glycosides, flavonoids, carbohydrates, fixed oils, steroids, tannins, and phenols.[14] Four solvents viz. petroleum ether, chloroform, ethanol, and water on the basis of increasing polarity for successive extraction of dried leaves of *T. dioica* were used.

Antimicrobial Activities of T.dioica (*Patola*)

Antibacterial activity is method to destroying or suppressing the growth or reproduction of bacteria. The term antibacterial terms derives from Greek word ―anti‖ that means against. The compound which destroys or suppresses the growth or reproduction of bacteria, and that type of compound or agent having such properties is called antibacterial agent or antibacterial compounds. These are the either drugs or any plants material that destroy or inhibit the growth of bacteria, chemotherapeutic agents also having ability to prevent or treat bacterial infections.

1. Phytochemical determination and antibacterial activity of *Trichosanthes dioica Roxb* (Patal), *Cucurbita Maxima* (pumpkin) and *Abelmoschus esculentus Moench* (Okra) plant seeds, Karmjit Singh (Roll No. 410LS2075) Under the guidance of Dr. Bismita Nayak,

Department of Life Science NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA-769 008, ODISHA.[15]

Part used: *Trichosanthes dioica* seed (plant seed extract).

Extracted with: *in vitro* by agar cup diffusion method by using distilled water as solvent and aqueous extract.

Antimicrobial activities tested: Antibacterial activity.

Test organisms Bacterial strains: *Escherichia coli, Klebsiella Pneumonia, Bacillus subtilis, Staphylococcus aureus, Pseudomonas flurescences.*

Method of assay: *in vitro* by agar cup diffusion method by using distilled water as solvent and aqueous extract.

Result reported: The seeds extract of the *Trichosanthes dioica* seed tested for their antimicrobial activities and showed an interesting antimicrobial profile against *Bacillus subtilis, Staphylococcus aureus, Klebsiella Pneumoniae, Escherichia coli*, and Pseudomonas *fluorescens* and zone of inhibition 14mm, 24mm, 12mm, 18mm, 20mm respectively was observed.

2. Prashant Kumar, Shikha Mehta et.al, A novel antimicrobial agents Trichosanthes dioica, International journal of pharma and bio sciences, Vol.1/Issue-3/Jul-Sep. 2010, ISSN 0975-6299.[16]

Part used: leaves, fruits and seeds extract of the *Trichosanthes dioica.*

Extracted with: mechanically crushed and extracted with distilled water at 70°C using Soxhlet up to 54 h.

Antimicrobial activities tested: Antibacterial.

Test organisms

Bacterial strains: *Staphylococcus aureus, Klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa* and *Mycobacterium smegmatis.*

Method of assay: Luria Bertani broth (High media), Middlebrook 7H9 (High media.), Luria Bertani Agar (High media) and sterile discs as well as streptomycin discs (High media) were used in antibiotic sensitivity testing.

Result reported

The leaves and seeds extract showed identical patterns of zone of inhibition of *Escherichia coli* bacteria whereas, their patterns of inhibition against *Mycobacterium smegmatis* were just opposite. Hence the results suggest that Trichosanthes dioica plant is very promising plant not only for its antidiabetic and antioxidant potential but also for its antimicrobial potential with special reference of anti-infective and anti-tuberculosis. Though, the extent of antibacterial activity of Trichosanthes dioica extract was of the following order: leaves> fruits> seeds.

Therefore, the most important finding is that its fruits and to some extent its seeds can be used as anti-infective whereas its leaves could be used for anti- tuberculosis treatment.

3. Hariti & Rathee *et al.* (1996) stated that the fixed oil of seeds of *Trichosanthes* species including *T. dioica* have antifungal property.[17]

4. Sreeshma Sreenath Et Al: Study On Antibacterial Activity Of Patola Nimba Rasakriya - An Ayurvedic Preparation For Topical Application On Dustha Vrana, International Ayurvedic Medical Journal, ISSN:2320 5091, November 2017 5(11).[18]

Sample used: Patola Nimba Rasakriya.
Test organisms: Bacterial strains- Staphylococcus aureus and Streptococcus pyogenes.
Method of assay: agar well diffusion method.
Result reported: It was observed that antibacterial activity of the test drug increased with increased volume against *S.aureus* and was observed that 25 µl and 50 µl volumes of Rasakriya showed antibacterial activity against *S.pyogenes*.

Zingiber Officinale Rosc. Shunthi

Zingiber Officinale is a creeping perennial on a thick tuberous rhizome, which spreads under the ground. In the first year, a green, erect reed like stem about 60cm high grows from this rhizome. The plant has narrow; lanceolate, 15-30 cm long leaves which die of each year. The odour and taste are characteristic, aromatic and pungent. The plant is indigenous to Southeast Asia and is cultivated in a number of countries including India.

Botanical name- *Zingiber Officinale.*
Family – *Zingiberaceae.*
Sanskrit Synonyms – *Shunthi, mahaushadh, vishw, nagar, vishvaushadh.*

Panchabhautik* constitution of *Shunthi

Ayurvedic pharmacodynamic properties

Rasa: *Katu*

Guna: *Snigdha*

Veerya: *Ushna*

Vipaka: *Madhura*

Chemical constituents and Phytochemistry

Ginger is a rich source of volatile oil. Zingiberol, zingiberene, phelleandrene and linalool are important constituents of the oil. They account for the aroma of the drug. The pungency of the ginger is due to gingerols and shogoals. Investigations have shown gingerol and shogoals to be mutagenic.[19] In addition, ginger contains a special group of compounds called diarylheptanoids including gingerenone.[20] The standardization of the drug is based on the presence of the pungent principles of the plants.

Antimicrobial Activities of *Zingiber officinale*

1. Onyeagba R.A., Ugbogu O.C. et.al, Studies on the antimicrobial effects of garlic (*Allium sativum* Linn), ginger (*Zingiber officinale* Roscoe) and lime (*Citrus aurantifolia* Linn), African Journal of Biotechnology Vol. 3 (10), pp. 552-554, October 2004, ISSN 1684–5315 © 2004.[21]

Part used: rhizome.

Extracted with: Aqueous and Ethanolic extracts.

Antimicrobial activity tested: Antibacterial.

Test organisms

Bacterial strains: *Staphylococcus aureus, Bacillus spp, Escherichia coli* and *Salmonella spp.*

Method of assay: agar well diffusion method.

Result reported: The aqueous and ethanolic extracts of garlic and ginger singly did not inhibit any of the test organisms. The highest inhibition zone of 19 mm was observed with a combination of extracts on *Staphylococcus aureus. Salmonella spp* were resistant to almost all the extracts except lime.

2. Arash Azizi, Shabnam Aghayan et.al, In Vitro Effect of *Zingiber officinale* Extract on Growth of *Streptococcus mutans* and *Streptococcus sanguinis*, International Journal of Dentistry, Volume 2015, Article ID 489842, 5 pages.

http://dx.doi.org/10.1155/2015/489842.[22]

Part used: Rhizome

Extracted with: Pure extract was used in different concentrations.

Antimicrobial activity tested: antibacterial.

Test organisms

Bacterial strains: *Streptococcus mutans* and *Streptococcus sanguinis.*

Method of assay: Serial dilution Method.

Result reported: *Zingiber officinale* extract has significant antibacterial effects on *S. mutans* and *S. sanguinis*; however, the latter requires higher concentration of the extract to reach MIC. Considering the obtained MIC and MBC values, *Zingiber officinale* extract can be incorporated into herbal mouth rinses and toothpastes for its antimicrobial effects.

3. Dara Muhammed Aziz, Mohammed Ahmad Wsoo et.al, Antimicrobial and antioxidant activities of extracts from medicinal plant ginger (*Zingiber officinale*) and identification of components by gas chromatography, Vol9 (10),
pp. 412-420, October 2015
DOI:10.5897/AJPS2015.1345
Article
Number5FAC45455775[23]

Part used: Rhizome of ginger.

Extracted with: acetone, ethanol, and cyclohexane extractions.

Antimicrobial activity tested: antibacterial.

Test organisms

Bacterial strains: *Escherichia coli*, *Staphylococcus aureus.*

Method of assay: disc diffusion bio assay.

Result reported: Plants with an average zone of inhibition in diameter of ≥ 2.8 mm was considered as those recording a significant antimicrobial activity. It indicates that *Z. officinale* has strong antimicrobial activity against all selected organisms. The cyclohexane extract of *Z. officinale* failed to show any activity against the selected bacterial isolates and it showed activity against only *Klebsiella.*

4. Gull et al. Annals of Clinical Microbiology and Antimicrobials 2012, 11:8

http://www.ann-clinmicrob.com/content/11/1/8.[24]

Part used: Ginger Rhizome

Extracted with: aqueous, methanol, ethanol extracts

Antimicrobial activity tested: Antibacterial

Test organisms

Bacterial strains: *Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis, Staphylococcus aureus, Klebsiella pneumoniae, Shigella sonnei, Staphylococcus epidermidis and Salmonella typhii.*

Method of assay: Disc Diffusion Method.

Result reported: ginger methanol and ethanol extracts are more effective against all tested bacterial strains than ginger aqueous extracts. *E. coli* and *Shigella* were also more susceptible to the ginger extracts. *E. coli* showed maximum susceptibility to the ginger ethanol extracts while *Shigella* showed maximum susceptibility to both ginger methanol and ethanol extract.

5. Kamrul Islam, Asma Afroz Rowsni et.al, International Journal of Science, Environment ISSN 2278-3687 (O) and Technology, Vol. 3, No 3, 2014, 867 – 871, ISSN 2278-3687 (O).[25]

Part used: Rhizome.

Extracted with: Ginger extracts in Soyabean oil.

Antimicrobial Activity tested: Antibacterial.

Test organisms

Bacterial strains: *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Vibrio cholerae, Klebsiella spp., and Salmonella spp.*

Method of assay: Disc Diffusion Assay.

Result reported: The antimicrobial activity of the ginger was found highest against Salmonella spp. while lowest activity was found against Escherichia coli. Staphylococcus aureus showed lower sensitivity to ginger extract as compare to the most other Gram-negative bacteria. This result also indicated that soybean extract of ginger was more effective as an antimicrobial agent compared to the soybean alone.

6. Sasidharan et al. Int J Curr Pharm Res, Vol 2, Issue 4, 4043, ISSN-0975-1491, 2010.[26]

Part used: rhizomes of ginger – wet and dry

Extracted with: The ground fresh ginger (200g) and dry ginger (50g) rhizomes were hydro distilled for 5 hrs in a Clevenger type apparatus. The oils were dried over anhydrous sodium sulphate and used for GC.

Antimicrobial activity tested: antibacterial and antifungal.

Test organisms

Bacterial strains: *Bacillus subtilis* (gram positive bacteria), *Pseudomonas aeruginosa* (gram negative),

Fungal strains: three fungi species namely *Candida albicans, Aspergillus niger, Penicillium* spp, *Saccharomyces cerevisiae* (yeast) and one dermatophyte which is a *Trichoderma* spp.

Method of assay: Disc Diffusion Method.

Result reported: The activity studies show that fresh ginger oil (FG) was on par with standard antibiotic against *Aspergillus niger, candida* and *Pseudomonas aeruginosa*, weaker towards *Saccharomyces cerevisiae* and inactive against *Bacillus subtilis, Pencillium spp* and *Trichoderma spp*. Dry ginger oil (DG) was more active towards *Pseudomonas aeruginosa*, on par with standard towards *Candida*, weaker than standard against *Bacillus subtilis, Aspergillus niger, Pencillium spp, Saccharomyces cereviseae*.

Tinospora cordifolia (willd.) (Guduchi)

Guduchi [Tinospora cordifolia (willd.)] Meirs ex Hook. F. & Thoms] is a large, glabrous, deciduous climbing shrub. It is distributed throughout tropical Indian subcontinent and china, ascending to an altitude of 300m.The stem of Tinospora cordifolia are rather succulent with long filiform fleshy aerial roots from the branches. The bark is creamy white to grey, deeply left spirally, the space in between being spotted with large rosette like lenticels. The flowers are small and yellow or greenish yellow. The seeds are curved. Fruits are fleshy and single seeded. Flowers grow during summer and fruits during winter.[27]

Botanical name- *Tinospora cordifolia (willd.)*

Family – *Menispermaceae.*

Sanskrit Synonyms – *Guduchi, Amruta, Jwarari, Jivantika.*

Panchabhautik* constitution of *Shunthi

Ayurvedic pharmacodynamic properties

***Rasa*:** *Kashaya, Tikta*

Guna: *Laghu*

Veerya*: *Ushna

Vipaka:* *Madhura

Chemical constituents and Phytochemistry

Numerous constituents belonging to different chemical classes such as alkaloid, terpenoid, lactone, glycoside, steroid, phenolics, aliphatic compounds, lignin, and polysaccharide have been isolated and characterized from different parts of *T.Cordifolia* in Table 1. Leaves are rich inprotein, calcium, and phosphorus (Singh SS et al., 2003; Sinha K., 2004). Methanol extract of leaves is rich in flavanoids, alkaloids and glycosides (Soni HP et al., 2011). A post harvest experiment has revealed that mechanical drying of the herb at 40°C provides the highest alkaloid (tinosporin) content (0.045%). However, the content decreases (0.033%) withdrying at 60°C or in direct sunlight. Further, the dried stem bits packed in polyethylene lined gunny bag retain the highest alkaloid content (0.042%) as compared to storage under ambient conditions (Padmapriya S et al., 2009). These findings suggest that tinosporin may be either photosensitive and/or thermolabile.[28]

Antimicrobial Activities of *Tinospora cordifolia (Willd.)*

1. Priyanka Mishra1, Preya Jamdar et. al *Int. J. Curr. Microbiol. App. Sci* (2014) 3(3): 224-234 ISSN: 2319-7706.

Part used: stem of *T.cordifolia.*

Extracted with: crude ethanolic extract, hydromethanolic extracts of the stem.

Test organisms

Bacterial strains: *Escherichia coli* (MTCC No.40), *Staphylococcus aureus* (MTCC No.87), *Proteus vulgaris* (MTCC No.742), *Pseudomonas aeruginosa* (MTCC No.424), *Bacillus subtilis* (MTCC No.441), *Staphylococcus epidermidis* (MTCC No.9041), and *Micrococcus luteus* (MTCC No.106).

Method of assay: Antibacterial assay using cup plate method.

Antimicrobial activity tested: Antibacterial activity.

Result reported: The crude ethanol extract of *T. cordifolia* showed activity against tested bacteria. The ethanolic extract exhibit effective antibacterial activity against all the organisms, except for E.coli, Proteus vulgaris and Pseudomonas aeruginosa while the hydromethanolic extract exhibits inhibition zone on limited species such like *Staphylococcus*

aureus (2mm), *Bacillus subtilis* (3mm), *Micrococcus luteus* (2mm), *Staphylococcus epidermidis* (4mm).[28]

2. Mahesh and Satish et.al, Antimicrobial Activity of Some Important Medicinal Plant Against Plant and Human Pathogens *World J. Agric. Sci., 4 (S): 839-843, 2008.*[29]

Part used: Methanol leaf extracts of *Tinospora cordifolia.*

Extracted with: Methanol leaf extracts of *Tinospora cordifolia.*

Test organisms

Bacterial strains: *Bacillus subtilis, Escherichia coli, Pseudomonas fluorescens, Staphylococcus aureus and Xanthomonas axonopodis pv.malvacearum.*

Fungal strains: *Aspergillus flavus, Dreschlera turcica* and *Fusarium verticillioides.*

Method of assay: Disc Diffusion Method.

Result reported: The methanol leaf extracts of Tinospora cordifolia showed significant antibacterial activity against *Bacillus subtilis, Escherichia coli, Pseudomonas fluorescens, Staphylococcus aureus* and *Xanthomonas axonopodis* pv. *malvacearum, Tinospora cordifolia recorded* significant antifungal activity against *D. turcica.*

3. R. Jeyachandran et.al, ANTIBACTERIAL ACTIVITY OF STEM EXTRACTS OF *TINOSPORA CORDIFOLIA* (Willd) Hook. f & Thomson, Vol : XXIII(1) July, August, September 2003 pg no40-43.

Part used: Stem of *T.cordifolia.*

Extracted with: *aqueous, ethanol and chloroform extracts from the stems of Tinospora cordifolia.*

Test organisms

Bacterial strains: *Escherichia coil, Proteus vulgaris, Enterobacter faecalis, Salmonella typhi (Gram-negative), Staphylococcus aureus and Serratia marcesenses (Gram-positive).*

Method of assay: In-vitro using disc diffusion assay.

Result reported: From the results it dictates that the greater activity resides in ethanolic stem extracts of plant since other extracts including chloroform and aqueous did not effectively inhibit the growth of the bacteria. This may due to the chemical constituents responsible for the antibacterial activity are more soluble in ethanol extracts.[30]

4. Nagaprashanthi.Ch et al, /I In vitro Antimicrobial Activity of *Tinospora cordifolia* and its Phytochemical screening nt. J. Pharm Tech Res.2012,4(3)

Part used: hydro alcoholic extract of T.cordifolia stem.

Extracted with: hydro alcoholic extract of *Tinospora cordifolia* creeped on *Azadirachta indica* Tree.

Test organisms

Bacterial strains: *Staphylococcus aureus, Escherichia coli, Klebsiella pneumonia, Pseudomonas sp,.*

Fungal strains: *Aspergillus niger, Aspergillus fumigates, mucor sp* and *Pencillium.*

Method of assay: Agar well diffusion method.

Result reported: *Tinospora cordifolia* stem extract creping on *Azadirachta indica* has potential antimicrobial activity similar to that of neem tree when compared to *Tinospora cordifolia* creping on fencing.[31]

5. V. Shanthi et.al, Anitbacterial activity of *Tinospora cordifolia* (Willd) Hook.F.Thoms on urinary tract pathogens, *Int. J. Curr. Microbiol. App. Sci* (2013) 2(6): 190-194.

Part used: leaves and stem.

Extracted with: aqueous, ethanol and chloroform extracts of leaves and stem of *Tinospora cordifolia* Hook.F.Thoms.

Test organisms

Bacterial strains: clinical isolates of urinary pathogens *viz., Escherichia coli, Klebsiella pneumoniae, Proteus vulgaris and Pseudomonas aeruginosa.*

Method of assay: Agar well diffusion method.

Result reported: Ethanol extract of leaf showed greater inhibitory action than other tested extracts. ethanol extract of leaf of *Tinospora cordifolia* has shown maximum inhibitory activity against *Klebsiella pneumoniae* followed by *Pseudomonas aeruginosa* while the Chloroform extract of leaf showed moderate activity against *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* but it has only poor effect against *E.coli.*

Ethanol extract of stem also showed maximum inhibitory activity against *Klebsiella pneumoniae* while it was moderate against all the other tested pathogen except *Proteus vulgaris*. Chloroform extracts of stem showed maximum zone of inhibition against

Pseudomonas aeruginosa and moderate inhibition was observed against *Klebsiella pneumoniae* and *E.coli* Aqueous extracts of both leaf and stem showed poor inhibitory activity against all the tested pathogens. *Proteus vulgaris* showed resistance to all the tested extracts.[32]

DISCUSSION

On the basis of the results procured from various studies carried out to check and test the potency as antimicrobials for each of the herbs, it could be observed that the aqueous as the alcoholic extracts possess and showcase antimicrobial activities. More or less for all three herbs it was observed that the alcoholic extracts show more antimicrobial activities when compared to their aqueous extracts. These anti-microbial activities can be attributed to the individual phytoconstituents of each herb which has potential capacity of inhibiting micro organisms. These phytoconstituents can put to use in beneficial way to the mankind and medical science. Also, Ayurveda has already mentioned the properties of *Patola*, *Shunthi*, *Guduchi* in various *Samhitas* and and have been mentioned as part of treatment and management of various diseases and are successfully used to cure infections and diseases.

CONCLUSION

Based on the above discussion it can be concluded that Based on the above discussion it may be concluded that nature is the best combinatorial chemist and possibly has answers to all diseases. Natural products and compounds discovered from medicinal plants (and their analogues thereof) have provided numerous clinically useful drugs. In spite of the various challenges encountered in the medicinal plant-based drug discovery, natural products isolated from plants will still remain an essential component in the search for new medicines.

The results have established the antimicrobial as well as antifungal activities of extracts (aqueous and alcoholic) *Trichosanthes dioica (Patola), Zingiber officinale (Shunthi), Tinospora cordifolia (Guduchi)*. This indicates that the phyto constituents present in the mentioned plants have considerable potential to inhibit micro organisms and diseases caused by fungi as well as the diseases resulting from bacterias. So the natural phytochemicals derived from *Trichosanthes dioica (Patola), Zingiber officinale (Shunthi), Tinospora cordifolia (Guduchi)* could be regarded as promising alternative to synthetic antifungals and antimicrobials for further save use.

REFERENCES

1. Diallo D, Hveem B, Mahmoud Ma, Betge G, Paulsen BS, An enthnobotanical survey of herbal drugs of Gourma district, Mali pharmaceutical Biology, 1999; 37: 80-91.
2. Mahesh B and Satish S, Antimicrobiail Activity of Some important Medicinal Plant Against Pant and Human Pathogens, World Journal of agricultural Sciences, 2008; 4(5): 839-843.
3. Balandrin MF, Holke JK, Wurtele E.S, National plant chemicals, source of industrial and medicinal material science, 1985; 228: 1154-1160.
4. Nadkarni Ak.Indian Materia Medica, 3rd ed. Mumbai, Popular Prakashan Pvt Ltd; 1982; 1236-7.
5. Dr sason et.al Pharmacological and phytochemical properties of patola Trichosanthes dioica, World Journal of Pharmaceutical and medical Research (WJPMR), 2016; 2(5): 156-159, ISSN 2455-3301.
6. Singh K. Pointed gourd (Trichosanthes dioica Roxb.) Indian Hort., 1989; 33: 35–8.
7. Kabir S. The novel peptide composition of the seeds of Trichosanthes dioica Roxb. Cytobios, 2000; 103: 121–31. [PubMed]
8. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal plants. 1st ed. New Delhi: CSIR, 2002; 340–1.
9. Ghaisas MM, Tanwar MB, Ninave PB, Navghare VV, Deshpande T. Hepatoprotective activity of aqueous and ethanolic extract of T.dioica in ferrous sulphate induced liver injury. Pharmacologyonline, 2008; 3: 127–35.
10. Toshihiro A, Yumico K, Yoshimasa K, Kunio K, Thakur S, Tamura T. 7-oxodihydrokarounidiol-3-benzoate and other triterpenes from the seeds of Cucurbitaceae. Phytochemistry, 1997; 46: 1261–6.
11. Kongton S. Chemical study of bioactive constituents from Trichosanthes cucumerina root and fruit juice. Hong Kong: Thesis, Mahidol University, 2003.
12. Ali N, Mohammed S, Kenoth R, Swamy MJ. Purification, physicochemical characterization, saccharide specificity, and chemical modification of a Gal/GalNAc specific lectin from the seeds of Trichosanthes dioica. Arch Biochem Biophysics, 2004; 432: 212–21. [PubMed]
13. Sharma RK, Chatterji S, Rai DK, Mehta S, Rai PK, Singh RK, et al. Antioxidant activities and phenolic contents of the aqueous extracts of some Indian medicinal plants. J Med Plants Res., 2009; 3: 944–8.

14. Mukherjee PK. Quality Control of Herbal Drugs. New Delhi: Business Horizons, 2002; 164–71.
15. Phytochemical determination and antibacterial activity of *Trichosanthes dioica Roxb* (Patal), *Cucurbita Maxima* (pumpkin) and *Abelmoschus esculentus Moench* (Okra) plant seeds, Karmjit Singh (Roll No. 410LS2075) Under the guidance of Dr. Bismita Nayak, Department of Life Science NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA-769 008, ODISHA.
16. Prashant Kumar, Shikha Mehta et.al, A novel antimicrobial agents Trichosanthes dioica, International journal of pharma and bio sciences, Vol.1/Issue-3/Jul-Sep. 2010, ISSN 0975- 6299.
17. Hariti & Rathee *et al.* (1996).
18. Sreeshma Sreenath Et Al: Study On Antibacterial Activity Of Patola Nimba Rasakriya - An Ayurvedic Preparation For Topical Application On Dustha Vrana, International Ayurvedic Medical Journal, ISSN:2320 5091, November 2017 5(11).
19. Nagabhushan M, Amonkar Aj and Bhide SV, Mutagenicity in zingerone in Salmonella/microsome assay, Cancer Lett, 1987; 36(2): 221-233.
20. Kikuzaki H, Kobayashi M, Constituents of Zingiberaceae, Diarylheptanoids from Rhizomes of Zingiber officinale, Phytochemistry, 1991; 30: 3947-3952.
21. Onyeagba R.A., Ugbogu O.C.et.al, Studies on the antimicrobial effects of garlic (*Allium sativum* Linn), ginger (*Zingiber officinale* Roscoe) and lime (*Citrus aurantifolia* Linn), African Journal of Biotechnology, October 2004; 3(10): 552-554, ISSN 1684–5315 © 2004.
22. Arash Azizi, Shabnam Aghayan et.al, In Vitro Effect of *Zingiber officinale* Extract on Growth of *Streptococcus mutans* and *Streptococcus sanguinis*, International Journal of Dentistry, Volume 2015, Article ID 489842, 5 pages http://dx.doi.org/10.1155/2015/489842
23. Dara Muhammed Aziz, Mohammed Ahmad Wsoo et.al, Antimicrobial and antioxidant activities of extracts from medicinal plant ginger (*Zingiber officinale*) and identification of components by gas chromatography, October 2015; 9(10): 412-420. DOI:10.5897/AJPS2015.1345 Article Number5FAC45455775
24. Gull et al. Annals of Clinical Microbiology and Antimicrobials, 2012; 11: 8. http://www.ann clinmicrob.com/content/11/18
25. Kamrul Islam, Asma Afroz Rowsni et.al, International Journal of Science, Environment ISSN 2278-3687 (O) and Technology, 2014; 3(3): 867 – 871, ISSN 2278-3687 (O).
26. Sasidharan et al. Int J Curr Pharm Res, 2010; 2(4): 4043, ISSN-0975-1491.

27. Kirtikar KR, Basu BD, editors, Indian Medicinal Plants, Vol 1,2nd ed. New Connaught Place, Dehradun; M/sBishen Singh, Mahendra Pal Singh
28. Priyanka Mishra1, Preya Jamdar et.al *Int. J. Curr. Microbiol. App. Sci.,* 2014; 3(3): 224-234. ISSN: 2319-7706.
29. Mahesh and Satish et.al, Antimicrobial Activity of Some Important Medicinal Plant Against Plant and Human Pathogens *World J. Agric. Sci., 2008; 4(S): 839-843.*
30. R. Jeyachandran et.al, ANTIBACTERIAL ACTIVITY OF STEM EXTRACTS OF *TINOSPORA CORDIFOLIA* (Willd) Hook. f & Thomson, July, August, September 2003; XXIII(1): no40-43.
31. Nagaprashanthi.Ch et al, /I In vitro Antimicrobial Activity of Tinospora cordifolia and its Phytochemical screening nt. J. Pharm Tech Res., 2012; 4(3).
32. V. Shanthi et.al, Anitbacterial activity of *Tinospora cordifolia* (Willd) Hook.F.Thoms on urinary tract pathogens, *Int. J. Curr. Microbiol. App. Sci.,* 2013; 2(6): 190-194.