



Pharmacological Activity Review on Selected Indian Traditional Medicinal Plants

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Review Article

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ABSTRACT

The medicinal plants are the rich source of therapeutic phytoconstituents. The wide range of plants possesses vast range of medicinal uses in humanity. In the present study a review was conducted for selected plants for the medicinal activity they possess which are scientifically published in reputed journals. The activity researched is antioxidant, anti-inflammatory, antibacterial, antiulcer, hepatoprotective and anticancer activity etc. The present review shown that *Pongamia pinnata*, *Nerium oleander* methanol extract and *Andrographis paniculata*, *Macaranga peltata* alcoholic extracts possess wide range of therapeutic activities such as antimicrobial, antioxidant, anti-inflammatory, wound healing and antidiabetic activity.

Keywords: *Antibacterial; antifungal; pongamia pinnata; Nerium oleander; Andrographis paniculata; Macaranga peltata.*

1. INTRODUCTION

Traditional medicinal plants are formally used for curing innumerable diseases [1]. In terms of medicinal uses mixture of Phyto compounds

found in extracts of plants are more effective therapeutically than isolated compounds. Many herbs in nature found to possess tissue regenerating property as they possess pharmacologically active compounds found in

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minute quantity along with energy boosting molecules such as carbohydrates, lipids and proteins to enhance the bioavailability of therapeutic secondary metabolites.

The plants possess various therapeutic activities which should be explored scientifically by systematic review, standardization and evaluation. Hence an attempt was made to review the selected plants to know the therapeutic activity they possess. The plants selected are *Pongamia pinnata*, *Nerium oleander*, *Andrographis paniculata* and *Mecaranga peltata*.

2. METHODOLOGY

In the review of medicinal plants used for antiseptic activity and using for skin care and wound treatment we done systematic approach in which as a part of review we collected all plants using for skin diseases treatment from materia medica. The extensive literature review was performed and came to conclusion that certain gaps exhibit in the medicinal plants usage as antiseptic skin protective. I found that the selected plants *Macaranga peltata*, *Pongamia pinnata*, *Nerium oleander* and *Andrographis paniculata* having the wound healing activity as well as skin protection supporting pharmacological activities.

2.1 *Pongamia Pinnata*

Singh RK et al. [2] reported, the anti-inflammatory activity of seed extracts of *Pongamia pinnata* in rat using carrageenan, bradykinin, PGE induced models and inflammation intensity measured by production of inflammatory molecules histamine and 5-HT. The result indicates that all extracts of seed (ethanol, petroleum ether, chloroform and acetone) shown anti-inflammatory activity when administered intra-peritoneally. (i.p)

Kumar P et al. [3] reported, the *Pongamia pinnata* flower and flower buds were having antibacterial and antifungal activity. Flower extracts shown higher antibacterial activity against *Staphylococcus aureus* and *Klebsiella pneumoniae* as compared to pod extract qualitatively identified by cup plate method not quantified. Flower extract shown higher antifungal activity than pod extract.

Raut RW et al. [4] reported that silver nanoparticles were synthesized by using dried

leaf extracts of *Pongamia pinnata*. The method represents an example of clean, nontoxic and eco-friendly method for obtaining silver nanoparticles. The capping around each particle furnish uniform chemical environment formed by the bioorganic compound present in the leaf broth, which may be mainly responsible for the stabilization of the particles. The antibacterial effect of nanosized silver colloidal solution against *Staphylococcus aureus* (ATCC 6538), *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* (ATCC9 027) and *Escherichia coli* (ATCC 8739) reveals high efficacy of silver nanoparticles. Morones [5] reported that silver nanoparticles of 10-100 nm size showed good antimicrobial effect against both Gram-negative and positive bacteria. The small AgNPs particle size enabled the adherence of particles to the cell wall and promoted easy penetration into the bacteria cell, which in turn improves their antimicrobial activity against bacteria.

Sikarwar MS et al. [6] reported, antidiabetic activity of *Pongamia pinnata* leaf extracts in alloxan-induced diabetic rats. The *Pongamia pinnata* aqueous extract and ethanol extract showed potent antidiabetic effect in alloxan-induced diabetic rats and reduced the mortality rate significantly.

Rani MS et al. [7] reported the antibacterial activity of *Pongamia pinnata* on clinically isolated pathogens. The ethanol and methanol extracts of seeds of *Pongamia pinnata* at concentration of 100µg/ml showed significant antibacterial activity on selected clinical microbial samples (*Pseudomonas aeruginosa*, *Serratia marcescens*, *Proteus vulgaris*, *Micrococcus luteus*, *Klebsiella pneumoniae*, *Staphylococcus aureus*).

Bhandirge SK et al. [8] reported, *Pongamia pinnata* bark ethanol extract having wound healing activity (In excision and incision wound model). The study showed that 10% ethanolic extract ointment shown significant activity then 5% ointment, povidone iodine ointment used as standard.

Ratnam KV et al. [9] reported, that the *Pongamia pinnata* bark having anthelmintic & anti-inflammatory activity. He performed anthelmintic activity in earth worms. The ethanol extract paralysed worms in 30min as compared to standard albendazole 26min and death time 35min & 30min respectively. The ethanol extracts 50mg/ml shown significant anti-inflammatory activity.

Kage DN et al. [10] reported, isolation of karajachromene from the seeds of *Pongamia pinnata*. Karajachromene at doses 25mg/kg & 50mg/kg shown 40.48% & 59.6% inhibition of paw oedema respectively as compared to standard diclofenac sodium (63.01%) at 10mg/kg body weight. He concluded that karajachromene exhibits anti-inflammatory reaction. The seed oil extracted using n-hexane for 20hr and after storage for 15days in cold condition the karajachromene crystals sedimented at the bottom test tubes.

Dwivedi D et al. [11] reported, wound healing, anti-microbial and antioxidant potential of *Pongamia pinnata* in wistar rats. The results confirm that *Pongamia pinnata* having potent significant wound healing activity. The results confirmed by changes in wound contraction, increase in tensile strength, increase in hydroxyproline and hexosamine content, variation in inflammatory and anti-inflammatory cytokine. The sample extracts also reported the moderate antimicrobial activity and antioxidant activity *In vivo*.

Shukla R et al. [12] reported, wound healing of ointment prepared by using *Pongamia glabra*, *Piper nigrum*, *Momordica charantia*. The study showed that *Momordica charatia* & *Pongamia glabra* which were orally and topically administered with *Piper nigrum* shown significant activity and in ointment formulation can be used as market product and the effect can be increased by oral dose in anaemic burn wound model.

Balasoorya D et al. [13] reported, the case study of wound healing activity of bark paste of *Pongamia pinnata* along with hirudotherapy. The *Pongamia pinnata* bark paste and *Flueggea leucopyrus* leaf paste was very effective and shows excellent wound healing effect in non-healing chronic wounds.

Purkait A et al. [14] reported that *Pongamia pinnata* can be effectively used as eco-friendly insecticide. In study author extracted seed oil and encapsulated in polyurea and analysed for physical and chemical properties and insecticidal activity in agriculture pests *A. gossypii* and *B. tabaci*. and obtained significant insecticidal activity.

Jahan S et al. [15] reported Pongamol is the major flavonoid of *Pongamia pinnata*. In this review article author highlighted the isolation

method of pongamol and the pharmacological activities it possess and reported safety issues.

Shirsat R et al. [16] reported the extraction of methanol extract of *Pongamia pinnata* seed and callus and performed HPTLC studies to know the constituents and antibacterial activity was measured by zone of Inhibition and concluded that the callus can be the alternate source for antibacterial activity for society.

Sharma S et al. [17] reported the antibacterial activity of methanol extracts(50, 100, 150, 200, 250, 400µg/ml concentration) of *P.pinnata* seed, flower, leaf, bark in microbes such as *E.coli*, *S.typhi*, *B.cereus*, *K.pneumonia* and *S.pyogenes*. and the results shown prominent bactericidal activity in agar well method.

Saghir F et al. [18] reported the bioactivity guided fractionation of Furanoflavonoid compound a antidiabetic compound from the flower extracts of *P.pinnata* using hexane. The result shown that three isomers of 4-methoxy-7-phenyl-5H-Furo [3,2g] 1 benzopyran-5-one possess better antidiabetic activity than standard acarbose and confirmed by molecular docking studies

2.2 *Nerium oleander*

Kumar S et al. [19] reported, anti-inflammatory activity and antipyretic activity of *Nerium oleander* in wistar rats. The result shows that chloroform and alcoholic extract having significant anti-inflammatory and antipyretic activity. The author concluded that above mentioned activities variation may be due to presence of alkaloids, sterols and flavonoids which are favourably extracted by ethanol and chloroform.

Singhal KG et al. [20] reported the antioxidant and hepatoprotective activity of methanol extract of *Nerium oleander* flowers against carbon tetrachloride induced liver injury in rats. The extract result indicates the effective *in vitro* antioxidant activity and *in vivo* lipid peroxidation inhibition and confirmed the significant hepatoprotective activity and antioxidant of the methanolic extract of flowers.

Benson KF et al. [21] reported, the aloe vera-based extract of *Nerium oleander* leaves (NAE-8®) shows significant antioxidant, anti-inflammatory, anti-apoptotic, and skin regenerative property. The result shown that NAE-8® extract have many beneficial effects to a

cellular antioxidant protection system, and decreased production of cellular free radical both in the absence and presence of an inflammatory molecule.

Akgun SG et al. [22] reported, wound healing activity of *Nerium oleander* in burn wound model. The study showed that burn wound can be analysed by inflammatory molecules (Malonaldehyde, Glutathione, Myeloperoxidase, TNF-alpha, IL-beta.) activity in all stages of inflammatory reaction. Silver sulphadiazine used as standard. Author concluded that *Nerium oleander* having anti-inflammatory activity & reduced inflammatory molecules & decreased %DNA which is high in burn wound.

Hase GJ et al. [23] reported, Fifty eight (58) compounds by performing phytochemical studies of *Nerium oleander* L. using GC-MS. The GCMS analysis of the solvent free extract of Nerium Oleander root has prominent anticancer, anti-inflammatory, antimicrobial, 5- α -reductase inhibition, nematocide, pesticide, analgesic, antioxidant activity due to presence of multiple phytoconstituents. *Nerium oleander* extracts Gas chromatography-mass spectrometry (GC-MS) analysis revealed the presence of the p-cresol, l-arginine, 2- methoxy phenol, mequinol, 2-methoxy phenyl ester, 2,4,6-decatricenoic acid etc. (Total 58 compounds).

Ko YS et al. [24] reported, cardiac glycosides oleandrin and its derivative odoroside A exhibit anticancer effects by inhibiting and suppressing the STAT-3 Signaling Pathway. The study conducted on MDA-MB-231 and RT-R-MDA-MB-231 cancer cells, in which both oleandrin and odoroside A shown better anticancer activity by inhibiting invasion/metastasis. The anticancer effects of both compounds might be due to the suppression of phospho-STAT-3-mediated pathways that are involved in the regulation of invasion-related molecules, such as EMT-related proteins and stem cell markers of cancer.

Kgosana KG [25] reported, the extraction techniques and quantification methods of oxalates in *Nerium oleander* as feed and other feeds. He concluded that aqueous extraction proved to be more valuable, safe, reliable and effective compared to the organic extraction methods.

Dey P et al. [26] reported, that standardized extracts of oleander stem and root limit acute hyperglycaemia by reducing systemic oxidative

stress response in diabetic mice. The oleander stem and root extract significantly lowered hyperglycaemia and insulin resistance without affecting insulin sensitivity.

Newman RA et al. [27] reported, antiviral effects of oleandrin. The findings are *Nerium oleander* having effective antiviral activity on enveloped viruses such as HIV-I, HTLV- I, influenza and venezuelan equine encephalitis. olenadrin active against HIV-I, HTLV- I, venezuelan equine encephalitis, chikungunya virus and SARS-CoV-2.

Guru S et al. [28] reported, the hyperkalaemia should be cautiously monitored in N.oleander clinical poisoning. Two Clinical cases of oleander poisoning was treated and ECG was monitored to know the cardiac changes related to arrhythmias simultaneously hyperkalaemia was compared in ECG. ECG shows deviation from the typical hyperkalaemia features.

Jaddoa NT et al. [29] reported antibacterial activity of N.oleander leaf alcoholic extracts against *Pseudomonas aeruginosa* in onion root cell. The result shown that 1200mg/ml of ethanolic extract having maximum antibacterial activity.

Carfora A et al. [30] reported poisoning of oleander leaf infusion. A laboratory technician committed suicide by consuming oleander leaf infusion. The toxicological investigation was performed by forensic laboratory where the Phytocompounds of toxic nature such as oleandrin and odoroside analysed by LCMS technique in biological fluids and concluded death due to consumption of oleander infusion.

2.3 *Andrographis paniculata*

Mishra PK et al. [31] reported, the antibacterial activity of *Andrographis paniculata* leaves against clinical pathogens namely *S. aureus*, *E. faecalis*, *P.aeruginosa*, *P.vulgaris* and *E.coli*. The result showed that 75% methanol extract is having antibacterial principles in high percentage which are inhibiting the methicillin resistant *S.a aureus*, *E. faecalis* & *M. tuberculosis*.

Deepak S et al. [32] reported, antioxidant & antimicrobial activity of *Andrographis paniculata* in DPPH radical scavenging assay & total reducing capacity. The leaf extracts shown considerable antioxidant & antimicrobial activity.

Pongtuluran OB et al. [33] reported, antiviral & Immunostimulant activity of *Andrographis paniculata*. The study showed that *Andrographis paniculata* ethanol extract inhibited *Simian Retro Virus* replication similar to Lamivudine (positive control) & having immunity enhancing property by stimulating cellular proliferation of lymphocyte at low concentration(1-16microgram) and extracted andrographolide was estimated by HPLC method.

Saini S et al. [34] reported, the traditional medicinal plants having wound healing activity along with anti-inflammatory, antioxidant, antimicrobial and analgesic activities. The study showed that petroleum ether & ethanolic extracts of *Andrographis paniculata* having effective wound healing activity and other supporting pharmacological activities.

Zou W et al. [35] reported, *Andrographis paniculata* extracts anti-inflammatory effect in rats by using pelvic inflammatory disease model through down regulation of the NF-kB pathway. In study, oral administration showed significant anti-inflammatory activity in pathogen induced PID rats with a potential mechanism of inhibiting the NF-kB pathway. In US clinics PID(Pelvic inflammatory disease) is treated by antibiotics as recommended by CDC (centre for disease control) only.

Polash SA et al. [36] reported, Investigation for phenolic content, antioxidant and antimicrobial compounds in *Andrographis paniculata* leaf and stem extracts. *A. paniculata* leaf and stem extracts were prepared using polar solvents water and ethanol and nonpolar solvent hexane. The highest total phenol content reported in ethanolic stem extract and the maximum free radical scavenging activity obtained in the aqueous stem extract.

Gan L et al. [37] reported, isolation of diterpenoid lactones possessing anti-inflammatory effects from the aerial parts of *Andrographis paniculata*. In present work isolated and identified seventeen diterpenoid lactones from *A. paniculata* including two new compounds, most of the diterpenoid lactones showed potent anti-inflammatory activity by reducing the secretion of Interleukin-6 and Tumour necrosis factor- α in LPS-stimulated RAW 264.7 macrophages. Author also identified and reported the key pharmacophores of diterpenoid lactones and developed a QSAR model to correlate the significant relationship

between the chemical structures and anti-inflammatory activity.

Mussard E et al. [38] reported, the diterpenoids in *Andrographis paniculata* extracts and the diterpenoids protect dermal fibroblasts against inflammation and oxidative stress. In the study, methanol extract with the active compound ANDRO (comprising 0.87% of ANDRO) showed a high antioxidant effect in HDFa cells. The methanol extract reported with the highest levels of bioactive compounds, followed by ethanol, water and chloroform. A large quantity of alkaloids, saponins, flavonoids, tannins, terpenoids and steroids has been found, along with the maximum quantity of andrographolide.

Liang Y et al. [39] reported, chromosome level genome assembly of *Andrographis paniculata*. In the present analysis the Cyp450 genes identified in *A. paniculata*, in which two hundred and five putative Cytochrome P450 genes with conserved motifs reported. The results showed that all major classes of Cytochrome P450 reported by the Nutzmans and Osbourn (2014) could be found in the *A. paniculata* genome. The number of Cyp450 genes with high expressions is larger in roots than in leaf. In the *A. paniculata* genome, author identified a total of Fifty three(53) putative terpene synthase genes, most of which belong to the TPS-a and TPS-b subfamilies.

Sa-Ngiamsuntorn K et al. [40] reported Anti-SARS-CoV-2 activity in human lung epithelial cells Calu-3 and the results are analysed using plaque assay method. The andrographolide and *A.paniculata* extracts shown significant activity at concentration 0.036 μ g/ml solution.

Xie R et al. [41] reported the anti COVID-19 activity by molecular docking studies. In the study andrographolide sulphate injection (Xiyanping) used in china selected and complexation with virus proteins and inhibition of virus was checked using molecular studies. And concluded a novel Phytocompounds can be isolated from kalmegh which may show prominent viral activity.

Swaminathan K et al. [42] reported inhibition efficiency of phytoconstituents from *A.paniculata* against SARS-CoV2 proteins performed by molecular docking studies. Concluded that Stigmasterol and Stigma-5,22-dien-3-ol as potential lead molecules for antiviral activity of corona virus.

2.4 *Macaranga peltata*

Subrahmanyam VM et al. [43] reported, antibacterial and antifungal potentials of *macaranga peltata*. The results showed that leaf yields 47% methanolic extract and 30% methanolic extract obtained from stem bark. In the study also concluded that leaf extract having better antibacterial activity against gram positive microbes than gram negative microbes.

Bijesh K et al. [44] reported, isolation and characterization of antibacterial compounds from *Macaranga peltata* against isolated clinical samples of *Staphylococcus aureus*. The antimicrobial effect of methanol extract of *M. peltata* leaves may be due to the individual activity or synergistic activity of these identified phytochemical compounds. The following compounds identified by LCMS techniques, compounds are shikmic acid, Musennin, Rhamnetin, Lupeol acetate, Corilagin and Quercetrin.

Verma M et al. [45] reported, antibacterial and antifungal potentials of *macaranga peltata*. The leaf and stem bark samples collected, shade dried and powdered. The methanol extracts of these samples were obtained by soxhlet extraction method. The yield obtained from leaf was 47% and from stem bark was 30%. Both the extracts proved moderate anti-bacterial activity, among them leaf extracts showed better anti-bacterial activity than the stem bark extract against both gram-positive and gram-negative bacteria.

Magadula JJ [46] reported, a review of phytochemical and pharmacological activity of the *Macaranga* genus. The three hundred known species of *Macaranga* plants, less than thirty species have been investigated phytochemically, this review calls for further work to be done on other known species of this genus. The major classes of compounds reported in the literature include flavonoids, stilbenes, terpenes, tannins, coumarins and others. The pharmacological review of the genus indicated many flavonoids and stilbenes to be isolated from the leaves and exhibited strong, moderate to weak anticancer properties, also showed significant antioxidant, anti-inflammatory and antimicrobial activity.

Badarudheen R et al. [47] reported, antibacterial activity of *Macaranga peltata*. The comparison of zone of inhibition in study indicates that methanolic extract of stem and leaves has better

antibacterial activity than the acetone and petroleum ether fruit extract.

Nehete M et al. [48] reported, the antioxidant, antimicrobial and wound healing potential of *macaranga peltata* bark extracts. The study confirmed that *Macaranga peltata* bark methanol extract having antimicrobial, antioxidant and wound healing activity.

Palakka S et al. [49] reported, antioxidant property of extracts of *Mecaranga peltata* by DPPH free radical scavenging activity. In the result the extracts demonstrated promising antioxidant activity, antioxidant activity correlated with phenolic content. The ethanol extract proved to be having highest antioxidant activity.

Palakka S et al. [50] reported, *In vitro* anticancer screening of ethanolic extracts of *Macaranga peltata* leaves. The ethanolic extract of *Macaranga peltata* leaves were subjected to MTT assay using HeLa and SK-Mel-28 cell lines. The extract gave promising result for the anticancer activity on both the cell lines with better effectiveness against the cervical cell cancer.

Thrinitha B et al. [51] reported, hepatoprotective activity of various extracts of *Macaranga peltata* on paracetamol-induced hepatotoxicity rats. The administration of methanolic concentrates of *Macaranga peltata* attenuated the hepatic marker enzymes and standard silymarin restored enzyme activities to normal values.

3. DISCUSSION

The *Pongamia pinnata* extracts (ethanol, petroleum ether, chloroform and acetone) of seed shown anti-inflammatory activity when administered intra-peritoneally (i.p). The flower extract shown higher antibacterial & antifungal activity than pod extract. The result reveals high efficacy of leaf broth silver nanoparticles as a strong antibacterial agent. *Pongamia pinnata* leaf aqueous extract and ethanol extract showed potent antidiabetic effect. The bark 10% ethanolic extracts ointment shown significant anti-inflammatory activity. The *Pongamia pinnata* bark ethanol extract better anthelmintic activity by paralysed worms in 30min as compared to standard albendazole 26min and death time 35min & 30min. The seed oil extracted using n-hexane for 20hr and after storage for 15days in cold condition resulted in sedimentation of karajachromene crystals at the bottom test tubes and reported that karajachromene exhibits anti-

inflammatory. The leaf methanol extract wound healing activity results confirmed by changes in contraction of wound, increase in tensile strength, increase in hydroxyproline and hexosamine content, modulation of pro inflammatory and anti-inflammatory cytokine, moderate in vivo antioxidant activity and antimicrobial activity. The other study showed that *Momordica charatia* & *Pongamia glabra* which were administered orally and topically with *Piper nigrum* shown significant activity and in ointment formulation can be used as market product and the effect can be enhanced by oral dose in anaemic burn wound model and bark paste shown excellent healing effect in chronic and non-healing wounds.

The *Nerium oleander* methanol extracts of flowers confirmed the significant hepatoprotective activity (in-vivo) and significant antioxidant activity (in-vitro). The leaf extract along with aloe gel result shows that NAE-8@ extract has multiple beneficial biological effects in a cellular antioxidant protection system, and reduces cellular free radical production, both in the absence and in the presence of an inflammatory molecule. The root extract result revealed the existence of the p-cresol, l-arginine, 2- methoxy phenol, mequinol, 2- methoxy phenyl ester, 2,4,6-decatrienoic acid etc. (58 compounds). *Nerium oleander* entire plant as a feed aqueous extraction proved to be more valuable, safe, reliable and effective compared to the organic extraction methods. The standardized extract of oleander stem and root significantly lowers hyperglycaemia and insulin resistance without affecting insulin sensitivity.. *Nerium oleander* having effective antiviral activity on enveloped viruses such as HIV-I, HTLV- I, influenza and venezuelan equine encephalitis, olenadrin active against HIV-I, HTLV- I, venezuelan equine encephalitis, chikungunya virus and SARS-CoV-2.

The *Andrographis paniculata* 75% methanolic leaf extract showed antibacterial principles in high percentage & active against methicillin resistant *S.aureus*, *E.faecalis* & *M.tuberculosis*. The leaf extracts shown considerable antioxidant & antimicrobial activity. In other study revealed that *A. paniculata* ethanol extract inhibited SRV(Simian Retro Virus) replication similar to Lamivudine positive control & having immunity enhancing property by stimulating lymphocyte cell proliferation at low concentration(1-16microgram) and extracted andrographolide was estimated by HPLC method. The petroleum

ether & ethanolic extracts of *A. paniculata* having effective wound healing activity and other supporting pharmacological activities.

In study oral administration of *A.paniculata* showed significant anti-inflammatory activity in pathogen induced PID rat model with a mechanism of inhibiting the NF-kB pathway. In US clinics PID is treated by antibiotics as recommended by CDC (centre for disease control) only. *A. paniculata* leaf and stem extracts were prepared using solvents such as water and ethanol as the polar solvents and hexane as the nonpolar solvent. The alcoholic stem extract showed the highest total phenol content and the water stem extract showed the maximum free radical scavenging activity. From the aerial part of *A Paniculata* Phytocompounds isolated and identified in which seventeen diterpenoid lactones reported including two new compounds, most of the diterpenoid lactones showed potent anti-inflammatory activity by reducing the secretion of IL-6 and TNF- α in LPS-stimulated RAW 264.7 macrophages. In the study, methanol extract with the bioactive compound ANDRO (comprising 0.87% of ANDRO) showed a high antioxidant effect in HDFa cells. The methanol extract had the highest levels of bioactive compounds, followed by ethanol, water and chloroform.

The *Mecaranga peltata* leaf and stem bark extract result showed that leaf yields 47% methanolic extract and 30% methanolic extract obtained from stem bark. The leaf extracts having better antibacterial activity against gram positive microbes than gram negative microbes. The antimicrobial effect of methanol extract of *M. peltata* leaves may be due to the individual activity or synergistic activity of these identified phytochemical compounds. The compounds identified by LCMS techniques, are shikmic acid, Musennin, Rhamnetin, Lupeol acetate, Corilagin and Quercetrin. The methanol extracts of leaf and stem bark was 47% and 30% respectively. Both the extracts proved moderate anti-bacterial activity, among them leaf extracts showed better anti-bacterial activity than the stem bark extract against both gram-positive and gram-negative bacteria.. The 300 known species of *Macaranga* plants, less than 30 plant species have been investigated phytochemically, this calls for further work to be done on other known species of this genus. The comparison of zone of inhibition in study indicates that methanolic extract of stem and leaves has better antibacterial activity than the acetone and petroleum ether fruit extract..

The study confirmed that *Macaranga peltata* bark methanol extract having antimicrobial, antioxidant and wound healing activity. The ethanol extract of leaves proved to be having highest antioxidant activity. The ethanolic extract of *Macaranga peltata* leaves were subjected to MTT assay using HeLa and SK-Mel-28 cell lines. The extract shown promising anticancer activity on both the cell lines and cervical cancer cell lines.. The administration of methanolic concentrates of *Macaranga peltata* leaves attenuated the hepatic marker enzymes and silymarin restored enzyme activities to normal values.

4. CONCLUSION

Pongamia pinnata flower extracts shown higher antibacterial & antifungal activity than pod extracts, the seed extracts also shown antibacterial activity at 100µg/ml concentration. The intra-peritoneally administration of seed extracts (ethanol, petroleum ether, chloroform and acetone) shown significant anti-inflammatory activity. The better anti-inflammatory activity reported by karajachromene isolated from seed oil. The 10% ethanolic extract ointment of bark and leaf shown significant wound healing activity in chronic and non-healing wounds. LEAF aqueous and ethanol extracts showed potent antidiabetic effect. The BARK ethanolic extracts paralysed worms in 30min as compared to standard albendazole 26min and death time 35min & 30min.

Nerium oleander having effective antiviral activity on enveloped viruses such as HIV-I, HTLV- I, influenza and venezuelan equine encephalitis. olenadrin active against HIV-I, HTLV- I, venezuelan equine encephalitis, chikungunya virus and SARS-CoV-2. The methanol extract of flowers Possess significant antioxidant activity(in-vitro).LEAF extract along with aloe gel that NAE-8® has maximum beneficial action to a cellular antioxidant protection system, and reduced cellular free radical production, both in the absence and presence of an inflammatory molecules. The chloroform and alcoholic extract having significant anti-inflammatory and antipyretic activity, but petroleum ether & aqueous extract having less activity. *Nerium oleander* having anti-inflammatory activity & reduced inflammatory molecules & decreased %DNA which is high in burn wound. The stem and root standardized extracts significantly lowers hyperglycaemia and insulin resistance without affecting insulin sensitivity. The oleandrin

and odoroside A have anticancer effects by inhibiting metastasis in both MDA-MB-231 and RT-R-MDA-MB-231 cancer cells. The aqueous extraction proved to be more valuable, safe, reliable and effective feed compared to the organic extraction methods. The methanol extract of flowers exhibited significant hepatoprotective activity(in-vivo). The root extract analysis revealed the existence of the p-cresol, l-arginine, 2- methoxy phenol, mequinol, 2-methoxy phenyl ester, 2,4,6-decatrienoic acid etc. (58 compounds).

The *Andrographis paniculata* leaves 75% methanol extract is having antibacterial principles in high percentage & active against methicillin resistant bacteria such as *S.aureus*, *E.faecalis* & *M.tuberculosis*. The leaf & stem ethanol extracts reported highest total phenol content and the aqueous stem extract obtained the maximum free radical scavenging activity than hexane extract. The ethanol extract showed antiviral & Immunostimulant activity reported by inhibition of SRV(Simian Retro Virus) replication similar to positive control Lamivudine & having immunity enhancing property by stimulating lymphocyte cell proliferation at low concentration(1-16microgram). The leaf extracts shown considerable antioxidant & antimicrobial activity. The methanol extract with the biologically active compound ANDRO (comprising 0.87% of ANDRO) exhibited a high antioxidant effect in HDFa cells. The methanol extract had the significant levels of bioactive compounds, followed by ethanol, aqueous and chloroform layer. The oral administration showed significant anti-inflammatory activity in pathogen induced PID rats. As a part of phytochemical analysis seventeen diterpenoid lactones isolated and identified from *A. paniculata* including two new compounds, most of the diterpenoid lactones showed potent anti-inflammatory activity.

The *Mecaranga peltata* leaf and stem bark extract yields 47% and 30% methanolic extract respectively and leaf extract having better antibacterial activity against gram positive microbes than gram negative microbes. The leaves found to possess following compounds which are identified by LCMS techniques, compounds are shikmic acid, Musennin, Rhamnetin, Lupeol acetate, Corilagin and Quercetrin. The methanolic extract of stem and leaves has better antibacterial activity than the acetone and petroleum ether extract. The ethanol extract of leaves proved to be having highest antioxidant activity. *M. peltata* bark

methanol extract having antimicrobial, antioxidant and wound healing activity. The ethanolic extract of *Macranga peltata* leaves were subjected to MTT assay using HeLa and SK-Mel-28 cell lines. The extract proved promising anticancer activity on both the cell lines with better effectiveness against the cervical cell cancer. The administration of methanolic extracts of *Macaranga peltata* leaf attenuated the hepatic marker enzymes and showed hepatoprotective activity

NOTE

The study highlights the efficacy of "Traditional Medicine" which is an ancient tradition, used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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