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Antimicrobial Activity of Some Plant Extractions

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ABSTRACT
This study evaluates the antimicrobial properties of extracts from Senna morning and Tinospora species against common pathogenic microorganisms. The extracts were prepared using solvents like ethanol, methanol, and water, and antimicrobial testing was performed using disk diffusion and broth micro dilution methods. Results showed varying degrees of antimicrobial activity, with both plant extracts showing significant inhibition against Gram-positive and Gram-negative bacteria and fungal strains. The findings support the potential of Senna morning and Tinospora as natural antimicrobial agents, providing a foundation for developing alternative therapeutic options for infectious diseases.
antibiotic-resistant microorganisms has necessitated the search for novel antimicrobial agents from natural sources. Senna, Moringa, and Tinospora are traditionally used plants in various cultures, which have been reported to possess antimicrobial properties.
To evaluate the antimicrobial activity of extracts from Senna, Moringa, and Tinospora against a panel of microorganisms.
The extracts were prepared using solvents of varying polarities and were tested against Gram-positive and Gram-negative bacteria, fungi, and yeast using the agar well diffusion method.
The results demonstrated that all three plant extracts exhibited significant antimicrobial activity, with the Senna extract showing the highest activity against Escherichia coli and Staphylococcus aureus. The Moringa extract exhibited notable activity against Candida albicans, while the Tinospora extract showed significant activity against Bacillus subtilis.

Keywords:
Microorganisms,Moringa,Senna,Tinospora.

I. INTRODUCTION

Research on antimicrobial substances has been intensive to reduce the risk of infectious diseases caused by bacteria, fungi, viruses, and parasites. Plant extracts are the primary source of therapeutic agents, including antimicrobial agents, for treating infectious diseases. P. undulata, a plant native to Sudan, has been traditionally used for various purposes, including treating alopecia, antispasmoic, and in local perfumes. It also serves as an antiepileptic, galactagogue, and insect repellent in folk medicine. P. crispa is used in various countries for various medicinal purposes, including heart disease treatment, inflammation treatment, antimicrobial agent, insect repellent, and carminative for colds, coughs, colic, and excessive sweating[1]. The medicinal properties of plants have gained significant interest due to their low toxicity, pharmacological activities, and economic viability. Studies have focused on the benefits of plant-extracted phytochemicals and their impact on human health. Natural additives from plants include compounds, groups of compounds, and essential oils. The food industry is increasingly interested in these compounds for direct addition or synergy with other compounds. Free radicals contribute to various pathologies like cancer, food degradation, and neurodegenerative diseases. The excessive use of antibiotics has led to antibiotic resistance, posing a public health concern.[2] The increasing number of multi-drug resistant microbial strains and reduced antibiotic susceptibility are attributed to the widespread use of broad-spectrum antibiotics, immunosuppressive agents, intravenous catheters, organ transplantation, and HIV epidemics. In developing countries, synthetic drugs are expensive, inadequate, and often have adulterations and side effects, necessitating the search for new infection-fighting strategies to control microbial infections. The study evaluated the antimicrobial properties of 24 medicinal plants used in Ayurveda and traditional medicine against various microbial pathogens.[3] Plants have been used to treat infectious diseases for centuries, with 115 articles published on their antimicrobial activity in Pub Med between 1966 and 1994. Between 1995 and 2004, 307 articles were published. A study found that lichen extracts have antibacterial effects against Legionella pneumophila strains.[4]

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Here are some other examples of plants:

SENNA

Senna also knoun as Alexandrian senna, Tinnevelly senna, cassia senna L Folia senna belongs to the family fabaceae, senna is naturally cultivated in east areas like Somalia, Kenya and also ccultivated in india, srilanka.[5] Senna is a 1-2.5 m high, undershrub legume plant with a pale green to light brown stem and long branches. Its pinnate leaves are greyish green, 2-5 cm long, and have four to eight oppositely paired leaflets. The inflorescences are raceme, and the root system consists of a central tap root and rhizomes. Senna has small flowers with five sepals.[6]

CHEMICALCONSTITUENTS

Alexanddrian and indiansenna leaves have similar chemical compositions, especially in their anthracene derivatives. Since tutin first isolated aloe emodin and rhein many other compounds based on these two structures have been obtained. A real breakthrough in the characterization of senna constituents was obtained by stoll.[7]The plant chemically contain sennoside A,B,C,D. sennosides present in the leaf and pod of this plant, are diglucosides of sennidins. Anumber of sennosides have been reported from senna additionally senna contain naphthalene glycosides flavonoids phytosterols myricyl alcohol, salicylic acid chrysophenic acid mucilage, resins and calcium oxalate. Glucosides and isorhamnetin, beta-sitosterol, sponins and polysaccharide. Senna, a plant known for its purgative properties, contains compounds like glucosides, isorhamnetin, beta-sitosterol, sponins, and polysaccharides. Sennosides, found in the leaf and pod, are diglucosides of sennidins. Cassia angustifolia is used for its purgative properties. Other plant components include rhein, aloe-emodin, chrysophanol.[8]

ICROBIAL ACTIVITY

Aqueous solution of senna plant are extracting out. Antimicrobial efficacy of various extracts was assessed by dics diffusion method against Gram positive bacteria staphylococcus aureus, Gram negative Escherichia coli. The methanol extract shows more inhibition than ehanol and water extracts. Staphylococcus aureus shows more inhibition zone than Escherichia coli.[9]

OTHER ACTIVITIES

Pharmacological effect	Mechanism of action
Laxative property	Inhibiting contractions in thr proximal colon
Anti obesity effect	Reduce energy intake and regulating intestinal flora
Hypoglycemic effect	Inhibiting alfa glucoamylase
Anti inflammatory effect	Inhibiting bacterial translocation
Anti tumor effect	Inhibiting slingshot family proteins to increasing cofilin phosphorylation
Anti-neurodegenerative effect	Inhibiting amyloid fibrillation of HL

MORINGA OLEIFERA

Moringa oleifera also known as moringa stenopetala, moringa concanensis, moringa peregrine beloning to the family Moringaceae.[11]Moringa oleifera is a tree with feathery tripinnate leaves and whitish gray bark, growing up to 10-12 meters. It produces fragrant, bisexual, yellowish white flowers in spreading or drooping panicles. Fruits are trilobed capsules, called pods, and are brown triangular. Seeds are round 1cm in diameter with a brownish semi-permeable hull and papery wings. Each tree can

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produce around 15,000 to 25,000 seeds per year.[12] Moringa cultivated in india Bangladesh and Nicaragua.

CHEMICALCONSTITUENT

Moringa contain various phytochemical, including alkaloids, saponins, tannins, phenolic acid, glucosinolates, flavonoids, and terpenes, which have numerous pharmacological uses. Around 110 compounds have been identified.[11] the ehole leaf flour contained 28.7% crude protein, 7.1%fat, 10.9%ashes, 44.4% carbohydrate and 3.0mg calcium and 103.1mg iron.3.1% albumin 0.3%globulins, 2.2% prolamin, 3.5% glutelin and 70.1%insoluble proteins[14] Lutein,beta-carotene, phytyl fatty acid ester, polyprenol, chlorophyll beta-sito sterol, triaculglycerols, fatty acids,fatty alcohols and saturated hydrocarbons isolated by leaves of moringa oleifera.[15]The World Health Organization (WHO) highlights the significant shift towards traditional medicine, with over 75% of the global population utilizing phytochemical products for healthcare. The medicinal properties of plants are influenced by their chemical composition, influencing physiological responses in the human body.[16]

SPECIES	PARTS	THERAPEUTIC USES
M.concanensis	Bark Leaves	Reduce pain, abortifacient External tumor
M. drouhardii	Bark	cold coughs
M.Peregrina	Leaves Bark Pods Roots	Skin rashes, paralysis Disinfectant to speed up wound healing Infantile paralysis or convulsions Malaria hypertension, stomach disorders, asthma, diabetes
M. rivae	Leaves Gum	Weakness of thigh and calf muscles Arthritis
M.stenopetala	Leaves ROOTS	Flu, diabetes, Malaria, Hypertension Malaria, Stomach pain
M.oleifera	Bark Root Leaf Gum Seeds flowers	Cough Epilepsy Helps during labor Diarrheal, dysentery rashes, Fever, asthma, dental decay Warta Tumor, inflammation, muscle diseases

ANTIMICROBIALACTIVITY

Antibacterial activity

The study investigated the antibacterial properties of various bacteria fractions and Moringa oleifera leaves extract. The antibacterial activity was assessed using the seed plate method, which involves adding nutrient medium to an agar medium at 45°C, mixing well, and pouring it into sterilized petri plates. After hardening, 100 µl of Moringa oleifera leaves extract and fractions were added.

Antifungal activity

The antifungal activity of M. oleifera leaves fractions was tested using the diffusion plate method. Mixing fungal spore suspension with melted Sabouraud dextrose agar in sterilized petri plates, the plates were seeded with holes and filled with the testing sample. Incubated at 28°C for 7-8 days, the zone of inhibition was compared to the standard, showing promising results in reducing fungal growth.[17]

Antiviral activity

M. oleifera extract exhibits antiviral properties, inhibiting HSV-1 strains in mice, reducing mortality, and activating cellular immunity at 750 mg/kg.

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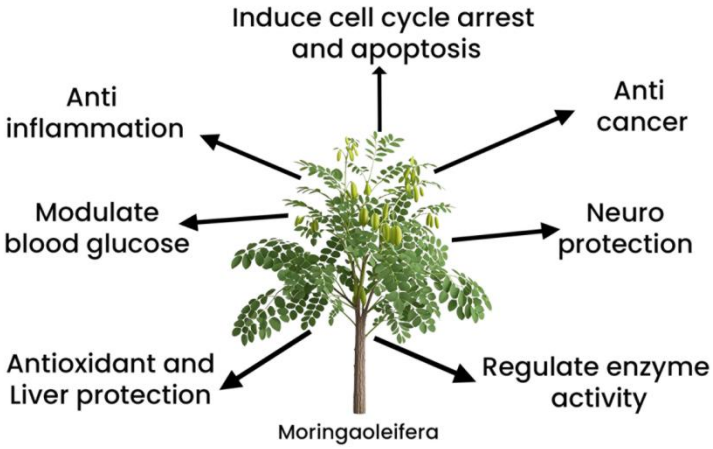
OTHER ACTIVITIES

Pharmacological activity	Mechanism of action
Antioxidants	Inhibiting oxidative stress
Anti-convulsant	Inhibited mortality block either calcium channels, sodium channels
Anticancer	Inhibited malignant astrocytoma cells
Antitrypanosomal	Inhibited trypanothione reductase
Antileishmanial	Against the L.donovani promastigotes
Anti fertility	Reduced fertility, exhibited oxytocic activity
Anti inflammation	Decreases the effect of peritorial inflammation and reduced the permeability of small blood vessels



TINOSPORACORDIFOLIA

Another names of tinospora is Tinospora sinensis, Giloya, Guduchi. Belonging to the family was Menispermaceae. Tinospora is cultivated in Myanmar, Sri lanka, India, china. Tinospora consists of Aerial roots, long, thread-like, from mature branches grow downward and sometimes reach the ground. A cortex divided into outer and inner zones. The plant's long fleshy stem, with aerial roots, and dried stem is cylindrical, slender, and slightly twisted. This plant has membranous, simple, alternate leaves with a long petiole. The leaves are intensely green, but over mature they turn yellowish. The lamina is ovatecordate and rich in protein, calcium, and phosphorus. The flowers are small, unisexual, greenish yellow, with males clustered and females solitary. Sepals are six in two series, and petals are smaller than se Fruits are fleshy, single-seeded drupelets on a thick stalk with sub terminal scars. They have an ovoid shape, smooth texture, and can be scarlet or orange red. These fruit appear during winter. Seeds are white, bean-shaped, and curved, and embryos can also turn into a curve shape automatically.

CHEMICALCONSTITUENT

T. cordifolia contains various chemical constituents including alkaloids, like tinosporine,magnoflorine, choline, berberine,palmatine, bebeerine, tembeterine, choline. Glycosides, steroids like giloinsterol, 20a-

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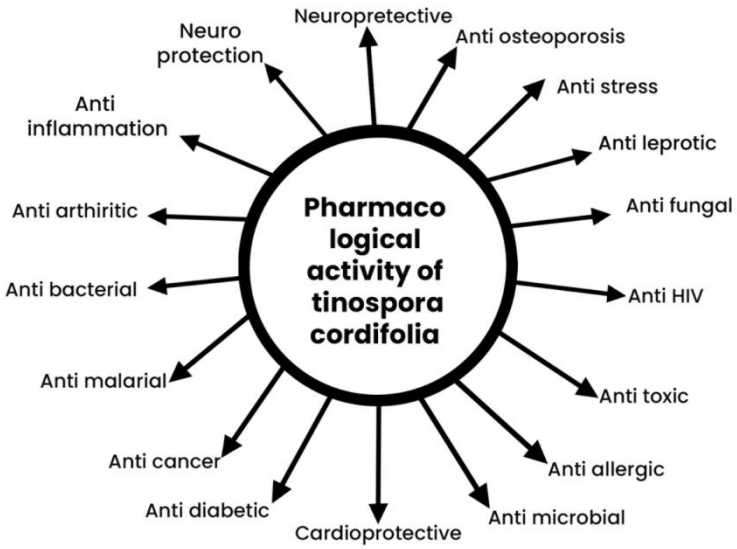
hydroxyl ecdysone. phenolics, aliphatic compounds, and polysaccharides, terpenoids like tinosporide, furanolactone diterpene, diterpenoid lactones, Its leaves are rich in protein, calcium, and phosphorus, while its stem contains clerodane furono diterpene glucoside, sesquiterpenoid.[19]

ANTIMICROBIAL ACTIVITY

The antimicrobial activity of four extracts (hexane, chloroform, methanol, and aqueous) was tested against three pathogenic bacterial strains: Bacillus subtilis, Pseudomonas aeruginosa, and Escherichia coli. Freshly grown bacterial inoculums were mixed with normal saline to adjust turbidity. The study used two methods to determine the antibacterial activity of four crude extracts: agar well-diffusion and disc diffusion. The agar well-diffusion method involved inoculating MHA petri plates with bacterial suspensions, adding 50µl of each extract, and incubating for 24 hours at 37°C. The activity was compared with standard antibiotic Ciprofloxacin and DMSO. The most potent extract was identified, and the compound structure was determined. A disc diffusion test was conducted to compare the nanofabricated extracts and the compound isolated from the most potent extract The broth microdilution method was used to measure the minimum inhibitory concentration (MIC) of extracts, isolated compounds, and nanoparticles. Mueller-Hinton broth was used to create serial dilutions in 96-well microplates, with 100 µl of bacterial suspension added to each well. Different concentrations of extracts are added, and the microtiter plates were incubated for 24 hours at 37°C. The minimum inhibitory concentration was determined to be the lowest concentration that showed no visible growth. [20]

OTHER ACTIVITIES



II. CONCLUSION

Anti microbial activity of extracts from senna, moringa, and tinospora against a panel of microorganisms, including bacteria fungi and yeast. The results demonstrated that all three plants extracts exhibited significant antimicrobial activity, with varying degrees of potency.The antimicrobial activity of the extracts may be attributed to the presence of bioactive compounds, including: Alkaloids: present in senna and tinospra which have been reported to exibit antimicrobial activity. Flavonoids: found in moringa which is shown to possess anti microbial properties. Glycosides: It is present in all three plants which may contribute to their anti microbial activity.

Senna: Showed strong antibacterial activity against both Gram-negative and Gram-positive microorganisms, including Escherichia coli and Staphylococcus aureus. Significant antibacterial action was demonstrated by Tinospora against bacterial and fungal infections, such as Bacillus subtilis and Candida albicans. Moringa: Showed antifungal efficacy against Aspergillus niger and

broad-spectrum antibacterial action against both Gram-positive and Gram-negative bacteria. Bioactive substances such alkaloids, glycosides, and flavonoids are responsible for these plants' antibacterial properties. According to these results, Senna, Tinospora, and Moringa may be helpful in the creation of new antimicrobial agents, especially those that combat bacteria that are resistant to antibiotics. The antimicrobial activity of these plants can be attributed to the presence of bioactive compounds, such as alkaloids, glycosides, and flavonoids. These findings suggest that Senna, Tinospora, and Moringa may be useful in the development of novel antimicrobial agents, particularly against antibiotic-resistant microorganisms. The polyherbal extract demonstrated significant antimicrobial activity against a range of microorganisms, including bacteria and fungi. Additionally, the extract exhibited potent antioxidant activity, which can help protect against oxidative stress and cell damage. Furthermore, the extract showed promising anti-helminthic activity, indicating its potential as a natural treatment for parasitic infections.

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