

PHYTOCHEMICAL ACTIVITIES OF *CONOCARPUS ERECTUS*: AN OVERVIEW

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Abstract: Mangroves speak to regions of high organic profitability and it is a locale wealthy in bioactive substances utilized in medication invention. *Conocarpus erectus* has placed in the family Combretaceae, in one of the two species of *Conocarpus* genus and ordinarily exists in tropical and subtropical regions of the world, right through West Indies, America and Africa. The fundamental goal of this audit was to draw attention to the applicable reported information distributed about its phytochemistry, therapeutic potential, botanical aspects as well as traditional uses of *Conocarpus erectus*. *C. erectus* is an evergreen tree with 20cm in diameter and 6m tall with scattering crown. This plant was selected because of its huge medicinal importance. The extract of *Conocarpus erectus* (leaves, shoot, bark & fruit) parts shows high antibacterial, antioxidant and hepta-protective activities due to phenolic content. It contains phenol such as tannin and flavinoid as major component. Tannin has high antibacterial activity than other compound. *C. erectus* is notable for its folkloristic curative potential.

Keywords: *Conocarpus erectus*, phytochemical, antibacterial, antioxidant, hepta-protective

Introduction

To expand the quality of wellbeing around the world the utilization of distinctive products medication has risen up out of conventional to present day treatment. To demonstrate the sensible utilization of natural prescriptions and to additionally build up pharmacological impacts of curative plants, logical methodologies are fundamental. The advancement of sciences and innovations has profoundly upheld the assessment on characteristic products medications in all angles. For centuries, restorative plants have been a significant fountain of curative agents, and still huge numbers of the present medications are plant-determined regular products or their subsidiaries (Cragg *et al.*, 2012; Kinghorn *et al.*, 2011). About 75% of other medicine and 60% medicine against malignant are derived from plants. Because of the nearness of various phytochemicals plants are medicinally important which they produce for the fulfillment of their own needs. For example for the protection from predators they produce alkaloids and each phytochemical has its own significance against the treatment of various disease (Wang *et al.*, 2005). Pakistan is a creating nation and for the treatment of various diseases its local population depends upon traditional medicines (Ahmad, 2004). There is practically 50k enrolled herbal experts accessible in Pakistan which use plants or plants parts, for the help of local community in treatment of various diseases (Gill, 2003). By the utilization of Information of plants' in the particular properties in people, makeup and malady medication have been passed from age to

age. In their most punctual uses, plants were straight forwardly used without mechanical preparing, for example, extraction, alteration, blending or decontamination. Plants were used simply by boiling, grinding and drying. On the other side persistent toxicities have been hardly ever studied (Chaveerach *et al.*, 2014). The foremost-composed records on therapeutic utilizations of plants date back to 2600 BC including around 1000 plant resolute meds and report the presence of a complex restorative framework in Mesopotamia. Egyptian prescription goes back to around 2900 BC; however it's most valuable safeguarded record is the "Ebers Papyrus" from around 1550 BC, containing in excess of 700 medications, mostly of plant causes (Borchardt, 2002; Cragg and Newman, 2013). A time of medication disclosure from microbial resources was started during the 1930s, after the revelation of penicillin in 1928, which put down the logical and money related establishment of the present pharmaceutical industry after World War II. Around then, the curative utilization of extort and moderate lysanitze innate products was progressively supplanted by the utilization of pure mixes (Beutler, 2009; David *et al.*, 2015). The use of natural compounds derived from plant, animals and microorganism as a medicine by humans is recorded from several decades. As the time passing the importance of these natural products is increasing day by day throughout our evolution. In addition, natural products had played a significant role in discovering drugs and in drug development. Furthermore In the

present decade scientists' interest in natural products discovery is increasing for developing more effective drugs that will cure the targeted area more precisely (Ji *et al.*, 2009). It is very most significant step against devastating diseases like cancer. For poor districts in all over the world medicinal plant are important for source of revenue. Most flowering plants are medicinal. Since the beginning of life human has been using plants for treatment of diseases. Pakistani and Indian physician wrote many books on the treatment of disease by plants prior to 1100AD. Indigenous people group of Pakistan play a crucial job in protection of restorative plants. Purposefully or unexpectedly, individuals have advanced procedures for doing as such in the type of customs, convictions and taboos. Different customary harvesting techniques depicted in one of the investigation recommend that they were proficient to use the regular assets (Shinwari and Qaiser, 2011). Pakistan comprises of assorted natural zones, rich botanical of more than 6000 plant species additionally and Pakistan is enhanced with normal resources. There are just about 6000 plant species that are accounted for in Pakistan and in excess of 1000 species are perceived as restorative and fragrant plants species. The interest of therapeutic plants is improving both in the created and creating nations (Bashir *et al.*, 2015).

Botanical description and habitat of *Conocarpus*

Conocarpus erectus has placed in the family Combretaceae, in one of the two species of *conocarpus* genus and ordinarily exists in tropical and subtropical districts of world, (Ayoub, 2010; Jagessar and Cox, 2010). *C. erectus* is an evergreen tree with 20cm in diameter and 6 m tall with scattering crown, which is a typical constituent of mangal in beach front region of tropical America (Bailey, 1976; West, 1977). The family Combretaceae has a place with the order myrtales and consists of 500 species and 20 genera. *C. erectus* is commonly known as Botocillo (Spanish), Mangle botoncillo, Button mangrove, Buttonbush, Yana, Mangle boton, Mangle Negro, Witte mangle, Mangle prieto. *Conocarpus erectus* is also known as button wood or button mangrove (Bashir *et al.*, 2015). *C. erectus* L. (Combretaceae), significantly known as mangrove button (Nascimento *et al.*, 2016). It is local to the beachfront regions of Africa and across the board in the southern drift of Florida, Bahamas, Mexico, West Indies, Galapagos Island and Central America. In South America, is available since Ecuador until Brazil (von Linsingen *et al.*, 2009). This Plant is a fundamental resource of natural product, other than curative agents. In addition, they additionally can be a potential source for a variety of synthetic constituents which are naturally active (Martins *et al.*, 2015). For centuries, plants with therapeutic targets have been utilized, to enhance health and to treat a few sickness

like cardiovascular disorder and infections (Atanasov *et al.*, 2015). Plants have been utilized by all civic establishments (about 60% of the total populace) for therapeutic purposes (Dey *et al.*, 2017). In a few districts, customary medications are favored over regular medicines since they are moderately reasonable, all the more effectively accessible and cause less symptoms (Modak *et al.*, 2015). The World Health Organization has created techniques to encourage the mix of customary prescription in good frameworks, to create rules for practices, to give universal gauges for items and to help clinical investigates on security and viability of the medicines utilized by people (Organization, 2013). *C. erectus* is broadly developed as an decorative tree around the world (Shohayeb *et al.*, 2013) and its wood is utilized for fence posts, crossties, turnery, vessel building, kindling and landscaping purposes (Carneiro *et al.*, 2010). In society prescription, this plant is utilized against iron-deficiency, catarrh, conjunctivitis, gonorrhoea, diabetes, prickly heat, fever, migraine, dying, tumors, orchitis, diarrhea, syphilis and swelling, (Abdel-Hameed *et al.*, 2012; Ayoub, 2010; Shohayeb *et al.*, 2013). The leaves are eaten, and their decoction is inebriated for fever. The bark and the product of this species are utilized as inoculate in the treatment of the wounds, diabetes, Haemorrhoids and Diarrhea (Raza *et al.*, 2016). A portion of the proven natural properties of *C. erectus* are hepatoprotective (Abdel-Hameed *et al.*, 2013), antioxidant (Abdel-Hameed *et al.*, 2014), anticancer (Abdel-Hameed *et al.*, 2012) and also antimicrobial (Shohayeb *et al.*, 2013) exercises. Likewise, it was proposed that ethanolic, n-hexane, chloroform and n-butanolic separates of the plant could be an intense source of curative agents in anticipating or abating the way toward aging and the oxidative anxieties related to degenerative diseases (Raza *et al.*, 2016). *C. erectus* is notable for its folkloristic curative potential including treatment of diabetes (Nascimento *et al.*, 2016). There are numerous abiotic stresses for a plant however saltiness is a noteworthy abiotic stress. Due to ion imbalance, ion toxicity, water stress, or a combination of all these factors, saline soils have bad impact on plant development and cause plant fatality (Asif *et al.*, 2014) In Pakistan because of unnatural precipitation, high temperature and more evapo-transpiration, Saltiness and terrible quality water system water is extremely basic issue. In this way, we have to choose salt and dry season tolerant plants. An experiment was conducted to check out the growth and ionic structure of *C. erectus* plant under stress condition. Plant was grown and treated with different stress. It concluded that *C. erectus* could bear saltiness above 40dSm-1. In this situation after fighting with limited water and stress, single plant will survive

Antimicrobial activities

Crude extort of different of *C. erectus* parts and purified tannin were studied against gram positive and gram negative bacteria and fungi by disc diffusion technique. Against *S. cerevisiae* (fungal specie) tannin extort show zone of inhibition 14.3-0.58mm and in the crude extort of leaves, fruit, stem along with flowers shown action in opposition to *S. cerevisiae* 13.3-0.5, 11.3-0.5, 11.0-1 and 10.3-0.5 respectively. While in the antibacterial activity gram positive bacteria was more sensitive as compared to acid fast and gram negative bacteria. Against *B.subtilis* and *S. aureus* zone of inhibition were noted 23.00 and 21.00mm respectively (Bashir *et al.*, 2015). A bacterial disease is an expansion of destructive strain of microscopic organisms on or inside the body. Microbes can taint any region of the body. Food contamination, Pneumonia and meningitis are only a couple of diseases that might be brought about by dangerous microbes. Natural products play an important role in the field of medicine opposite to various infections. From many years ago plants used as antibiotics (Hussein, 2016) studied the antibacterial and antioxidant activities of *Conocarpus erectus* leaves against the four bacterial strains i.e. *E. coli*, Streptococcus, *Enterobactor* & *S. aurous* and FRAP (Ferric Reducing Antioxidant Power) assay respectively. N-butanol extort of *C. erectus* leaves was used in this study. The results showed that butanol extract possessed higher anticancer activity as compared to ascorbic acid and butyl hydroxytoluene and the development of all bacterial strains was also inhibited by this plant. From many centuries, plants are used as medicines. Now a day's derivatives of plants become a focusing point because of its marvelous applications. Plants are used as folk medicines. Which Plant contains flavonoids and tannins major component. Due to the proximity of phenolic mixes the concentrate of *C. erectus* from various parts (leaves, fruits, bark and stem) indicated high cancer prevention agent, hepato-protective and anticancer movement. Antimicrobial activity was higher in tannins than any other phenolic mixes, (Bashir *et al.*, 2015). Plants has been used to improve human health status and for cardiovascular disease and other infections. *Conocarpus erectus* leaf extract showed that *C. erectus* leaves had antioxidant and antibacterial feature. These discoveries add to logical data for the adequacy on utilization of this plant in the advancement of a phytotherapeutic compounds, (Santos *et al.*, 2018). In many countries plants has been used as medicine. The normal antimicrobial agents need is expanding tremendously because of bacterial conflict towards anti-infection agents. It has been found that *C. erectus* would-be a good antibacterial source for gram +ve & gram -ve bacteria. To check out the enzyme inhibition and antioxidant properties of aerial parts of three selected plants (*C. erectus*, *F. maclellandii*, *F. variegata*)

were used. The results showed that rough ethanolic extort of *C. erectus* had greatest antiradical rummage force and *F. maclellandii* diminishing antioxidant power. Among all therapeutic plants, *F. variegata* (chloroform) was the most dynamic in total antioxidant capacity. *Conocarpus erectus* displayed most acute enzyme inhibition action in butanolic extort while extort showed significant action (Raza *et al.*, 2016). Owing from their adaptable applications plants are still a radiant source of new restorative operators. As a culture medication, *C. erectus* was accounted to utilize for recuperating from numerous ailments. The four defatted methanol concentrates of *C. erectus* distinctive parts (leaves, flowers, fruit and stem) checked by two in vitro cancer prevention agent strategies demonstrate high cell reinforcement and hepatoprotective action (Abdel-Hameed *et al.*, 2013)

Phytochemicals

C. erectus is one of the species, which has been used for many diseases. Such as fever, diabetes, catarrh, cancer, diarrhea and many more. In the further studies of this significant plant, the methanolic extort of *C. erectus* fruit subjected to silica gel column by reverse phase column chromatographic fraction (RP-HPLC–UV–ESI-MS). The results showed that plant had high content of phytochemicals in *C. erectus* fruits. Plant showed high antioxidant activity. High antioxidant activity showed in methanolic extort plant can be used as efficient natural antioxidant (Abdel-Hameed *et al.*, 2014). Phytochemicals separated from *C. erectus* includes Ellagic acid, 3,3'-Dimethoxyellagic Acid and Gallic Acid (Nawwar *et al.*, 1982), Castalagin, Ellagitannin, 12 other phenols and a new trimethoxy-ellagicglycoside, 3,3,4-tri-O-methyellagic acid 4-O-B-glucopyranuronide (An amorphous yellow powder) compounds are isolated from leaves of *conocarpus* (Ayoub, 2010). An assessment about *Conocarpus erectus* for the phytochemical analysis by subjecting methanolic extract of *Conocarpus erectus* fruit through rp-hplc-uv-esi-ms High-performance Liquid Chromatography-Ultraviolet-Electro spray Ionisation-mass spectrometry. Tannin was the major component with modest quantity of flavonoids. Ellagic acid and gallic acid were identified based on the mass pattern, retention time and mass spectra with standards (Abdel-Hameed *et al.*, 2014). Saponins, tri-terpenoids, flavonoids, tannins were recognized in the N-hexane, aqueous and meOH extort of *C. erectus* correspondingly while alkaloids and coumarins were absent (Nascimento *et al.*, 2016).

Nanoparticles

All the special uniqueness of nanoparticles is due to their tiny sizes, which have less than 100nm in one dimensioned. Because of their small sizes nano particles are most effective than other particles .An experiment for the synthesis of zinc nano particles by

using leaf extract of *C. erectus* and *N. indicum*. Techniques of XRD [X-Ray Diffract meter] and SEM [scanning electron microscope] were used to synthesis the green nano particle. The size of silver nano particles was examined 10-70nm in range. A greater value of phenolic content up to $296 \pm 9 \mu\text{g/g}$ was observed in Methanolic extract of *C. erectus* as compared to $185 \pm 6 \mu\text{g/g}$ in *N. indicum* (Ahmed *et al.*, 2016a). Therefore, *Conocarpus erectus* was a high-quality reducing agent because of its higher value of phenolic content and make the whole procedure non-hazardous and green method. As compared to other heavy metals like silver or gold, copper nanoparticles play an imperative part because of their magnetic properties, high surface area to volume ratio and optical and high thermal conductivity. An experiment was conducted for synthesis of copper nano-particles by using leaf extract of *C. erectus* and *N. indicum*. Techniques of XRD [X-Ray Diffract meter] and SEM [scanning electron microscope] were used to synthesis the green nano-particle. The size of copper nano-particle was examined 30-70nm in range. A greater value of phenolic content up to $296 \pm 9 \mu\text{g/g}$ was observed in Methanolic extract of *C. erectus* as compared to $185 \pm 6 \mu\text{g/g}$ in *N. indicum*. *Conocarpus erectus* was a high-quality reducing agent because of its higher value of phenolic content, (Ahmed *et al.*, 2016b). All the special uniqueness of nano particles is due to their tiny sizes, which have less than 100nm in one dimension. Because of their small sizes nano particles are most effective than other particles. An experiment for the synthesis of silver nano particles by using leaf extract of *C. erectus* and *N. indicum*. Techniques of XRD [X-Ray Diffract meter] and SEM [scanning electron microscope] were used to synthesis the green nano particle. The size of silver nanoparticles was examined 35-55nm in range. A greater value of phenolic content up to $296 \pm 9 \mu\text{g/g}$ was observed in Methanolic extract of *C. erectus* as compared to $185 \pm 6 \mu\text{g/g}$ in *N. indicum*. Therefore, *Conocarpus erectus* was a high-quality reducing agent because of its higher value of phenolic content and make the whole procedure non-hazardous and green method, (Ahmed *et al.*, 2016a). Naturally, heavy metals are present in the soil, but environment is being contaminated because of other local source like traffic, industry, combustion of fossil fuels. Plants interrelate with the environment and change the atmosphere. The effects of soil and atmosphere pollution on some heavy metals (Fe, Zn, Pb, Cu, Mn and Cd) concentration in Button wood (*C. erectus*) leaves were studied. Sample was collected in two stages for chemical analysis. The results showed that phases of leaf testing were not shown any critical impact on the grouping of the sizeable heavy metals in the leaves. In the soil sample the level of these metals was lower as compared to the suggested level.

Industry and traffic was reported as the main source of pollution during this study (Gholami *et al.*, 2012). All the special uniqueness of nano-particles is due to their tiny sizes, which have less than 100nm in one dimensioned. Because of their small sizes nano-particles are most effective than other particles. An experiment for the synthesis of Cobalt nano particles by using leaf extract of *C. erectus* and *N. indicum*. Techniques of XRD [X-Ray Diffract meter] and SEM [scanning electron microscope] were used to synthesis the green nano particle. The size of silver nano-particles was examined 20-60nm in range. A greater value of phenolic content up to $296 \pm 9 \mu\text{g/g}$ was observed in Methanolic extract of *C. erectus* as compared to $185 \pm 6 \mu\text{g/g}$ in *N. indicum*. Therefore, *Conocarpus erectus* was a high-quality reducing agent because of its higher value of phenolic content and make the whole procedure non-hazardous and green method.

DPPH Assay

Natural products play an important role in the field of medicine opposite to various infections. From many years ago plants used as antibiotics (Hussein, 2016) studied the antibacterial and antioxidant activities of *Conocarpus erectus* leaves against the four bacterial strains i.e. *E. coli*, Streptococcus, Enterobacter & *S. aureus* and FRAP (Ferric Reducing Antioxidant Power) assay respectively. N-butanol extort of *C. erectus* leaves was used in this study. The results showed that butanol extract possessed high antioxidant potential as compared to ascorbic acid and butyl hydroxytoluene and the development of all bacterial strains was also inhibited by this plant.

Hepa-protective activities

By using methanol extract of flower, fruit and stem of *Conocarpus erectus* for the execution of intoxicated albino rats by giving dose of 500 mg/kg for the period of 15 days surprisingly lowered the level of blood ($P < 0.01$ and $p < 0.5$) while the level of urea in blood was not decreased (Bashir *et al.*, 2015).

Anticancer activities

Cancer is a sickness that is described by cells in the human body constantly increasing with the failure to be controlled or halted. Thus, shaping tumors of dangerous cells with the possibility to be metastatic. Essential oils are found to have different dynamic parts, which can appear in vitro cytotoxic activity against different destructive cell lines (Safwat *et al.*, 2018). An investigation reports the in vitro cytotoxic impacts of the basic oil from *Conocarpus erectus*. MTT assays and brine shrimp were used to examine the cytotoxic impacts of *C. erectus*. In opposite to brine shrimps larva and HepG2cancer cells Cytotoxicity of the essential oil was deliberate. Methanol extort of *C. erectus* was good against brine shrimp larva, Volatile oil showed good result against human cancer cell line. By using SRB assay method on n-butanol and ethyl acetate extorts of leaves,

flower, stem and fruit cytotoxicity studied was carried out. In Egypt at National cancer Institute breast cancer cell line (MCF-7) and liver cancer cell line (HepG2) were used. Leaves and stem fractions show maximum inhibition in activity. Against HepG2 cell line IC50 of ethyl acetate extort of leaves was 8.99ug/ml and extort of stem was 8.97ug/ml. The value of IC50 was also considered for all the tested extorts of *Conocarpus erectus* against MCF-7. N-butanol division of flower shows highest inhibition and its IC50 was 7.60ug/ml. ethyl acetate division also showed importance which was IC50 10.82ug/ml. Along with all the tested extorts of *Conocarpus erectus* most of the sample show significant inhibition in the average array of NCI (American cancer institute) as their IC50 value was <20.

Conflict of interest

The authors declare absence of any type of conflict of interest.

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